

**SPECIFICATIONS
FOR
COHN ELEMENTARY SCHOOL ADDITION
Project # 64-002-24A**

OWNER:



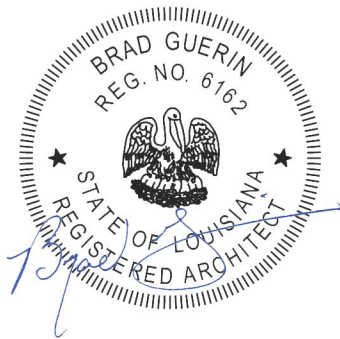
WEST BATON ROUGE PARISH SCHOOL BOARD

Dr. Chandler Smith, Superintendent

SCHOOL BOARD MEMBERS

Burke Fiscus, District I
Hayley Clouatre, District II
Dr. Atley Walker, District III
Ronald "Blue" LeBlanc, District IV
Sonceria Moore Evans, District V

Chareeka Grace, District VI
G. A. Chustz Jr., District VII
Matthew Daigrepoint, District VIII
Michael A. Maranto, District IX
Teri Bergeron, At-Large



DATE:

JULY 1, 2025

ARCHITECT:



A Joint Venture

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Interior Lighting Compliance Certificate

Project Information

Energy Code: 2021 IECC
Project Title: Cohn Central Plant Building
Project Type: New Construction

Construction Site:
805 14th Street
Port Allen, Louisiana 70767

Owner/Agent:
Chad Fontenot
WBR Schools
3761 Rosedale Rd.
Port Allen, Louisiana 70767
225-343-8309
chad.fontenot@wbrschools.net

Designer/Contractor:
John Hobbs
Forte and Tablada, Inc.
9107 Interline Avenue
Baton Rouge, Louisiana 70809
225-927-9321
hobbsj@forteandtablada.com

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft ²)	C Allowed Watts / ft ²	D Allowed Watts
1-School/University	1290	0.72	929
Total Allowed Watts =			929

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
1-School/University				
LED: J: 8' Utility Strip: Other:	1	9	64	576
LED: K: Canopy: Other:	1	1	52	52
Total Proposed Watts =				628

Interior Lighting PASSES: Design 32% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2021 IECC requirements in COMcheck Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

JOHN E. HOBBS SR. PROJ. MGR
Name - Title

John E. Hobbs
Signature

7-1-2025
Date

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.3.1 [EL22] ¹	Spaces required to have light-reduction controls have a manual control that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern ≥ 50 percent.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1.1, C405.2.1.1 [EL18] ¹	Occupancy sensors installed in classrooms/lecture/training rooms, conference/meeting/multipurpose rooms, copy/print rooms, lounges/breakrooms, enclosed offices, open plan office areas, restrooms, storage rooms, locker rooms, corridors, warehouse storage areas, and other spaces ≤ 300 sqft that are enclosed by floor-to-ceiling height partitions. Reference section language C405.2.1.2 for control function in warehouses and section C405.2.1.3 for open plan office spaces.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1.2 [EL19] ¹	Occupancy sensors control function in warehouses: In warehouses, the lighting in aiseways and open areas is controlled with occupant sensors that automatically reduce lighting power by 50% or more within 20 minutes of when the areas are unoccupied. The occupant sensors control lighting in each aisleway independently and do not control lighting beyond the aisleway being controlled by the sensor. Lights not turned off by occupant sensors is done so by time-switch.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1.3 [EL20] ¹	Occupant sensor control function in open plan office areas: Occupant sensor controls in open office spaces ≥ 300 sq.ft. have controls 1) configured so that general lighting can be controlled separately in control zones with floor areas ≤ 600 sq.ft. within the space, 2) general lighting in each zone permitted to turn on upon occupancy in control zone, 3) automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the space, 4) are configured so that general lighting power in each control zone is reduced by $\geq 80\%$ of the full zone general lighting power within 20 minutes of all occupants leaving that control zone.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.2.1 [EL21] ²	Each area not served by occupancy sensors (per C405.2.1.1) have time-switch controls and functions detailed in sections C405.2.2.1.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

1 High Impact (Tier 1)	2 Medium Impact (Tier 2)	3 Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.4, C405.2.4.1, C405.2.4.2 [EL23] ²	Daylight zones provided with individual controls that control the lights independent of general area lighting. See code section C405.2.3 Daylight-responsive controls for applicable spaces, C405.2.3.1 Daylight responsive control function and section C405.2.3.2 Sidelit zone.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.5 [EL27] ¹	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.7 [EL26] ²	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.8 [EL27] ²	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.9.1, C405.9.2 [EL28] ²	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Exception: Requirement does not apply.
C405.10 [EL29] ²	Total voltage drop across the combination of feeders and branch circuits $\leq 5\%$.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.1.1 [EL30] ²	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy ≥ 65 lm/W or luminaires with efficacy ≥ 45 lm/W or comply with C405.2.4 or C405.3.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Exception: Requirement does not apply.
C405.11, C405.11.1 [EL31] ²	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and $> 25\%$ of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.11.1.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Exception: Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1)	2 Medium Impact (Tier 2)	3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.2 [FI17] ³	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.1.1 [FI57] ¹	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.2.5 [FI16] ³	Furnished as-built drawings for electric power systems within 90 days of system acceptance.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.3 [FI33] ¹	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

DIVISION 01
GENERAL REQUIREMENTS

SECTION 01 01 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Use of premises.
 - 4. Work restrictions.
 - 5. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Cohn Elementary Addition
 - 1. Project Location: 805 14th St. Port Allen, Louisiana
- B. Owner: West Baton Rouge Parish School Board
 - 1. Owner's Representative: Chad Fontenot
- C. User Agency: West Baton Rouge Parish School Board
 - 1. User Agency Representative: Chad Fontenot
- D. Architect: BCB Architects + Dean Hotard Architects & Associates, a Joint Venture ,P.O. Box 213, Plaquemine, LA 70765. Jeremy Lucas Mobile: 225-235-4754, use of mobile number for the contractor is a privilege and as such will be treated with

the following conditions:

1. Acceptable hours for use are between 8:00am and 5:00pm Monday through Thursday and from 8:00am to 11:00am on Fridays. **Use of Architects mobile number outside of the hours listed will not be answered.** This policy applies for Text messages as well as Voice phone calls.
2. **Text Messages:**
 - a. Photographs are not permitted to be transmitted via text message unless permission granted.
 - b. If the contractor requires information that can not be accurately responded to with yes or no as the answer and thus requiring more length, the contractor is required to submit the question via email and is not permitted to send the question to the architect via text message.
3. **The Architects email address is as follows:**
 - a. jeremy@bcbapc.com
 - b. Use of email address is expected for transmission of any of the following, but not limited to:
 - Questions requiring and answer other than yes or no, see phone usage rules above.
 - Transmission of Pictures, see phone usage rules above.

E. The Work consists of the following:

The work of this contract consists of replacing classroom buildings with new classroom building. Phase one will consist of a new classroom building and additional parking as shown on the site plan. Demolition of existing classroom buildings and HVAC plant will be conducted once phase one is completed and the owner has moved out of the existing buildings and into the new phase one building. HVAC systems for the existing Cafeteria building to remain will also be completed during the phase one portion of the project prior to the demolition of the existing classroom buildings and HVAC plant. Demolition of existing HVAC plant will also require the removal of all associated underground piping.

New exterior walls will be load bearing metal stud with fiberglass faced reinforced gypsum panels and interior gypsum board painted finish with cavity insulation and continuous rigid insulation below finish. New flooring will consist of vct, resinous epoxy in restrooms, and LVT. Suspended acoustical tile ceilings with Led light fixtures will be incorporated throughout. HVAC modifications will also be included in the scope of work.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a CMAR process

1.5 USE OF PREMISES

A. GENERAL DESCRIPTION

Work included: This Section applies to situations in which the Contractor or his representatives including, but not necessarily limited to suppliers, subcontractors, employees, and field engineers, enter upon User's property.

Related Work: Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

B. QUALITY ASSURANCE

Promptly upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.

Require that all personnel who will enter upon the User's property certify their awareness of and familiarity with the requirements of this Section.

C. TRANSPORTATION FACILITIES

Truck and equipment access: Provide adequate protection for curbs and sidewalks over which trucks and equipment pass to reach the job site. Special care is to be given to existing concrete sidewalks and curbs around the building, any damage is to be repaired to match existing at no additional cost to the owner. Repair work is to blend seamlessly with existing concrete sidewalks and curbs, so as not to appear to be a patch work repair.

Contractor's vehicles: Require Contractor's vehicles, vehicles belonging to employees of the Contractor, and all other vehicles entering upon the User's property in performance of the Work of the Contractor, to use only the area designated by the User Agency.

D. SECURITY

Restrict the access of all persons entering upon the User's property in connection with the Work to the actual site of the Work.

Contractor will have free access to only the areas that require his attention. Other areas not affected by this contract shall be considered "OFF LIMITS". Contractor to submit a schedule for review and coordination to Architect for submittal to Owner.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "Master Format" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01 10 00

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 01 00 - SCOPE OF WORK

PART 1 - GENERAL

All provisions in the "General Conditions" shall apply to all work done under this section and all other sections in these specifications and drawings.

SCOPE

This contract consists of renovating and existing building for a tenant build out to house the Department of Veterans Affairs as shown in the contract documents.

EXAMINATION OF SITE

Before submitting proposals for his work, each bidder will be held to have examined the site and satisfied himself as to the existing conditions under which he will be obligated to operate, or that will in any manner affect the work under this contract. No allowance shall be made subsequently in behalf of the contractor for any error or negligence on his part.

LAYING OUT WORK

The contractor shall take full responsibility for laying out the new work within the existing space.

MEASUREMENTS

Before ordering any material or doing any work, the contractor shall verify measurements at the building and shall be responsible for the correctness of same. No extra charge or compensation will be allowed for the differences between actual dimensions and the measurements indicated on the drawings. Any differences which may be found shall be submitted to the Architect for consideration before proceeding with the work.

MATERIALS AND WORKMANSHIP

Unless otherwise specifically provided in the Drawings or Specifications, all equipment, materials and articles incorporated in the work shall be new of the best quality. The workmanship shall be in accordance with the best modern practices in every respect. Where there is a choice or discrepancy in the bid documents the contractor shall provide the most thorough, costly, and complete means, methods, or materials.

INSTALLATION

Whether specified or not all materials shall be provided and installed for a complete job and in strict accordance with the material manufacturer's instructions.

OWNER AND USING AGENCY

The owner/using agency shall be City of Baton Rouge

LAWS, PERMITS AND REGULATIONS

The plans and specifications have been developed with the intent of meeting or exceeding the minimum required standards and restrictions. Should the Plans and Specifications fail to comply with these standards or restrictions, the Architect will be notified of any such failures prior to submission of a bid proposal. After submission of a bid proposal, it will be the Contractor's responsibility to have all work comply with the intent of the Plans and Specifications.

PERMITS AND LICENSES

The contractor shall secure all permits and licenses required and shall pay all fees required to complete the job.

LABOR

Each contractor shall comply with all Laws of the State of Louisiana regulating the employment of Labor.

PART II - PRODUCTS

Not applicable.

PART III - EXECUTION

Not applicable.

END OF SECTION 010100

SECTION 01 10 35 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this Section. Requirements of this Section amplify and do not modify provisions of the General and Supplementary Conditions.
- B. Section 01 33 00 - Submittals and Requests for Information

1.2 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued or confirmed by the Architect in writing.

1.3 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Architect, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the proposal request, within five (5) calendar days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change. Include an itemized list of work to be performed and labor and material unit costs. Where requested, furnish data to substantiate costs and quantities. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 3. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Requests: When concealed or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
 - 1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 - 2. Include an itemized list of work to be performed and labor and material unit costs. Where requested, furnish data to substantiate costs and quantities. Indicate

applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- C. Proposal Request Form: Submit Change Order Proposals in the form and detail as requested by the Architect.
 - 1. **All Change Order Requests must include as applicable, ASI Number ,RFI number In BOLD text**

1.4 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Architect may issue a Construction Change Directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract and permit preparation of a Change Order.
- C. No change orders should be initiated by the Contractor without written approval from the Architect (no exceptions).

1.5 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor on AIA Form G701, as provided in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 10 35

SECTION 01 31 20 - PROJECT MEETINGS

PART 1 GENERAL

ALL PROJECT MEETING AGENDAS AND ACCEPTED MEETING MINUTES SHALL BE POSTED TO THE CONTRACTOR'S PROJECT MANAGEMENT CLOUD BASED SYSTEM, SUCH AS PROCORE, AUTODESK BUILD, PROJECT PRO, OR SIMILAR. THE ACCEPTED MEETING MINUTES MUST BE POSTED NO LATER THAN 72 HOURS AFTER THE MEETING WAS HELD. THE INFORMATION DESCRIBED ABOVE AND HEREIN SHALL BE PERFORMED BY THE GENERAL CONTRACTOR.

1.1 Related Documents

- A. Section 010100 Summary – Architect
- B. Section 013300 Submittals and Requests for Information.

1.2 SUMMARY

- A. Project meetings:
 - 1. Regular meetings throughout Project life for discussion and resolution of Project issues. These meetings will be held on a frequency related to Project status, ie., weekly, bi-weekly, monthly, or others.
 - 2. Attendance by the Contractor, Owner, and Architect is mandatory. Architect's engineers or consultants, Contractor's subcontractors, suppliers, and others are to attend on an as-needed basis or as directed by Architect.
 - 3. Suggested agenda:
 - a. Progress review
 - b. Construction Schedule (mandatory at every monthly meeting) – No exceptions.
 - c. Submittal's status
 - d. Change Order status
 - e. RFI status
 - f. Other business
- B. Requirements below are intended for Contractor, subcontractors, sub-subcontractors, and material suppliers for discussion and resolution of Project specific situations. Attendance by Owner, Architect, Architect's engineers or consultants is not mandatory.
 - 1. Meetings between Contractor, Owner, Architect, or any combination of the three for purpose of discussing Project progress or resolving problems are delineated above.
 - 2. Owner and Architect may attend meetings to ascertain work is expedited consistent with Contract Documents and construction schedules.
- C. Contractor requirements include:
 - 1. Schedule and administer preconstruction meeting, periodic progress meetings, and specially called meetings throughout work progress.
 - 2. Prepare agenda for meetings.
 - 3. Distribute written notice of each meeting four days in advance of meeting date.
 - 4. Make physical arrangements for meetings.
 - 5. Preside at meetings.
 - 6. Record minutes; include significant proceedings and decisions.
 - 7. Reproduce and distribute copies of minutes within three days after each meeting as follows:

- a. One copy to each participant in meeting.
 - b. One copy to parties affected by decisions made at meeting.
 - c. Three copies of minutes to Architect.
 - d. One copy to Owner's representative.
- D. Representatives of contractors, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- E. Related sections:
 - 1. Section 013200 - Construction Progress Documentation
 - 2. Section 013300 - Submittals
- F. Pre-construction meeting:
 - 1. Schedule within 10 days after date of Notice of Award.
 - 2. Location: Central site, convenient for all parties, designated by the Owner.
 - 3. Attendance:
 - a. Owner's Representative
 - b. Architect and professional consultants.
 - c. Resident Project Representative
 - d. Contractor's Superintendent
 - e. Major subcontractors.
 - f. Major suppliers.
 - g. Others, as appropriate.
 - 4. Suggested agenda:
 - a. Distribution and discussion of:
 - i. List of major subcontractors and suppliers.
 - ii. Projected Construction Schedules
 - b. Critical work sequencing.
 - c. Major equipment deliveries and priorities.
 - d. Project coordination: Designation of responsible personnel.
 - e. Procedures and processing of:
 - i. Field decisions.
 - ii. Proposal requests.
 - iii. Submittals.
 - iv. Change Orders
 - v. Applications for Payments
 - f. Adequacy of distribution of Contract Documents.
 - g. Procedures for maintaining Record Documents.
 - h. Use of premises:
 - i. Office, work and storage areas.
 - ii. Owners requirements.
 - i. Temporary facilities, controls, and construction aids.
 - j. Temporary utilities.
 - k. Safety and first-aid procedures.
 - l. Security procedures.
 - m. Housekeeping procedures.
 - n. Other: _____
- G. Progress meetings:
 - 1. Schedule regular periodic meetings as required, but not less than two meetings monthly.
 - 2. Hold called meetings as required by progress of work.
 - 3. Meeting's locations: Project field office of Contractor.
 - 4. Attendance:
 - a. Subcontractors, as appropriate to agenda.

- b. Suppliers, as appropriate.
- c. Architect and professional consultants, as needed or required.
- d. Others.
- 5. Suggested agenda:
 - a. Review, approval of minutes of previous meeting.
 - b. Review of work in progress since previous meeting.
 - c. Field observations, problems, conflicts.
 - d. Problems which impede Progress Schedule
 - e. Review of off-site fabrication, delivery schedules.
 - f. Corrective measures and procedures to regain projected schedule.
 - g. Revisions to Progress Schedule.
 - h. Progress; schedule, during succeeding work period.
 - i. Coordination of schedules.
 - j. Review submittal schedules; expedite as required.
 - k. Maintenance of quality standards.
 - l. Pending changes and substitutions.
 - m. Review proposed changes for effect on:
 - i. Progress schedule and on completion date.
 - ii. Other contracts of Project.
 - n. Review Monthly Pay Applications with attached construction schedule (mandatory).
 - o. Other

PART2 GENERAL

CONTRACTOR IS RESPONSIBLE FOR ALL ITEMS IN THE SUBMITTAL LOG AND RFI LOG AND ENSURING THAT ALL RESOLUTIONS FOR THE WEEK ARE ADDRESSED IN THE WEEKLY MEETING

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting schedules and reports.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Owner's Representative.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.

- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
- B. **THE GENERAL CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING MEETING MINUTES, SUBMITTALS, AND ALL CORRESPONDANCE/CONSTRUCTION ADMINISTRATION THROUGH THE USE OF PROCORE, AUTODESK BUILD, PROJECT TREK, OR EQUAL. THIS WILL COME AT NO ADDITIONAL COST TO THE OWNER OR ARCHITECT. THE OWNER AND ARCHITECT SHALL HAVE FULL USE TO THE PROJECT SHARING SITE.**
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. **See submittal procedures.**
- C. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- D. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- E. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- F. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- G. Construction Schedule Updating Reports: Submit with Applications for Payment.
- H. Material Location Reports: Submit at bi-weekly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.

- J. Special Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Owner's Representative's request.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Owner's Representative.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Owner's Representative's administrative procedures necessary for certification of Substantial Completion.

6. Punch List and Final Completion: Include not more than 45 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.

- e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
 - 1. Temporary enclosure and space conditioning.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 0129000 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Primavera, or Meridian Prolog, for operating system.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.

- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Owner's Representative's approval of the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

2.4 REPORTS

- A. Material Location Reports: At bi-weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

2.6 WEATHER REPORTS

- A. Weather conditions will be provided on a daily report independent of an activity report, for every calendar day of the duration of the project weekends included. Accumulated rainfall or lack thereof must be logged in the weather report from an onsite gauge. Photographic All weather reports for the month must be submitted by the 5th day of the following month or they will not be considered as a potential claim and thus the month in question will not be used for any time extensions in the future. If the Architect and Owner agree to the days requested for the month that the request has been claimed, the Architect shall issue a letter to the contractor noting the number of days that the contract can justifiably be extended for the month of the claim. The letter issued will also keep a running total for the entire project calendar to date of permissible days to be added to the contract. The time extension of the contract will only be adjusted at the end of the contract via the last change order for the project prior to issuance of Substantial Completion to start the warranty period and lien periods for the project, no exceptions.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Owner's Representative, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 32 20 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final Completion construction photographs.
- B. Related Sections include the following:
 - 1. Division 1 Section "Submittal Procedures" for submitting construction photographs.
 - 2. Division 1 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Include the same label information as the corresponding set of photographs.
- B. Construction Photographs: Submit digital images electronically per month of each photographic view within seven days of taking photographs. Coordinate with Architect in determining areas to be photographed.
 - 1. Identification: For each digital image provide the following information:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Date photograph was taken.
 - e. Description of vantage point, indicating location of construction.

2. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document. Identify electronic media with date photographs were taken. Submit images that have the same aspect ratio as the sensor, uncropped.
3. CDs: Contractor shall retain photographic CDs for three years after date of Substantial Completion.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual designated by contractor who is familiar with photographing experience of similar type work.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPEG format, with minimum sensor size of 4.0 megapixels or better.

PART 3 - EXECUTION

3.1 PHOTOGRAPHS, GENERAL

- A. Photographer: Engage a qualified person employed by the General Contractor to take construction photographs.
- B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
- C. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect.

3.2 CONSTRUCTION PHOTOGRAPHS

- A. Preconstruction Photographs: Before starting construction, take twenty color digital photographs of Project site from different vantage points, as directed by Architect.

1. Take digital photographs to show existing conditions of the site before starting the Work, or as many others as required to document existing conditions that are not intended to be part of this contract.
- B. Periodic Construction Photographs: Take four sets of color digital photographs monthly with the cutoff date associated with each Application for Payment. Photographer shall consult with Architect to select vantage points to best show status of construction and progress since the last photographs were taken. A minimum of six vantage points, maximum of eight vantage points.
- C. Architect - Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of color photographs and general directions on vantage points. Photographer shall select actual vantage points and take photographs to best show the status of construction and progress since the last photographs were taken, (minimum 6 and maximum 8 vantage points).
- D. Final Completion Construction Photographs: Take twenty color digital photographs of overall project after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.
 1. Do include date stamp.
- E. Additional Photographs: Architect may issue requests for additional digital photographs, in addition to periodic photographs specified.
 1. Photographer will be given three days' notice, where feasible.
 2. In emergency situations, photographer shall take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

END OF SECTION

SECTION 01 33 00 SUBMITTALS AND REQUESTS FOR INFORMATION

PART ONE - GENERAL

1.01 DESCRIPTION:

- A. Submittals: General term including samples, shop drawings and product data, as applicable and as defined by the General Conditions.
- B. General Provisions:
 - 1. Provisions in this section are mandatory procedures for review, approval and submitting samples, shop drawings and product data in accordance with the General Conditions.
 - 2. Materials for all product specifications shall be offered of both standard and premium materials / finishes for the selection by the Architect, regardless of if directly stated in individual specification sections for basis and materials and finishes.
 - 2. Submittals which are received directly from sources other than through the General Contractor's office will be returned to the General Contractor "without action".
 - 3. Job delays occasioned by requirement of re-submission of samples, shop drawings and product data not in accord with Contract Documents and/or submittals sequenced contrary to the agreed schedule are Contractor's responsibility and will not be considered valid justification for extension of contract time or increase in the contract sum.
 - 4. Submittals will be categorized and submitted by building (building 1 school, building 2 gym, building 3 field house). Each submittal will indicate the corresponding specification number and/or drawing sheet number and will also indicate which building to which it pertains (indicated on the shop drawing transmittal cover page). For instance, Curtain wall submittals for building 1 will be grouped and submitted separately from building 2 and building 3.

1.02 SAMPLE PREPARATION:

- A. Prepare samples in sizes, shape and finish in accord with provisions of individual specification sections.
- B. Samples are not to be confused with full size, on-the-site "Mock-Ups" called for in some specification sections.
- C. Samples shall be submitted for the Architect's selection and approval in accordance with the Contractor's submittal schedule or sooner as needed to maintain construction progress. Approvals and color selections will not be made unilaterally where samples or selections of adjacent materials must be made for the purpose of aesthetics. Submit samples for adjacent and interrelated materials concurrently. The Owner will approve all colors before the Architect can take action.
- D. The number of samples submitted shall be the number required by the Contractor, plus two (2) which will be retained by the Architect and the Owner, unless otherwise indicated.

1.03 SHOP DRAWING PREPARATION:

- A. Drawing shall conform to the following requirements:
 - 1. Number sheets consecutively.
 - 2. Indicate working and erection dimensions and relationships to adjacent work.
 - 3. Show arrangements and sectional views, where applicable.
 - 4. Indicate material, gauges, thicknesses, finishes and characteristics.
 - 5. Indicate anchoring and fastening details, including information for making connections to adjacent work.
 - 6. Provide drawings reproducible by normal blue printing; original and prints legible
 - 7. Indicate working and erection dimensions and relationships to adjacent work. Concurrent submittals of different aspects of work may be required by the Architect as deemed necessary to demonstrate Contractor's ability to understand these relationships and coordinate the Work.
 - 8. Provide 6" x 6" clean space in the lower right hand area for entry of approval stamps.
 - 9. Cross-reference drawing details and specification paragraphs applicable to the submittal data.
 - 10. Do not use blue-colored stamps, ink or pencil on transparencies; "Blue" is not reproducible in blueprinting.
- B. Form: Xerox copies or as agreed to in Pre-Construction Meeting.
- C. Contractor shall provide an above ceiling coordination BIM model for review by design team within 90 days of recordation of contract.

1.04 PRODUCT DATA PREPARATION:

- A. Include product manufacturer's standard printed material, dated, with product description and installation instructions indicated. Data not related to this project shall be deleted or marked "VOID" as applicable.
- B. Form: Number of copies submitted shall be the number required by Contractor plus two (2) which will be retained by Architect and Owner.
- C. Printed material shall be:
 - 1. Legible.
 - 2. Sized no larger than 8-1/2" x 11", suitable for opaque reproduction.
 - 3. Stamped (either on a clean-area space or the reverse side) with the Contractor's approval action.
- D. All submitted data shall bear the Contractor's approval action stamp plus his review notes, comments, and corrections as required.

1.05 CONTRACTOR'S REVIEW:

- A. The following "Contractor's Stamp" must be on each shop drawing before the architect will review the shop drawing. Failure to stamp shop drawing with this stamp causes automatic rejection of the shop drawing.

THE CONTRACTOR'S STAMP

"By approval of this shop drawing, product data or sample, we represent that we have determined, verified, and approved all materials, field measurements, quantities, and field construction criteria related thereto, that we have checked and coordinated the information contained herein with the requirements of the Work and of the Contract Documents. Any "minor" deviations from the plans and specifications have been highlight in bright red to bring notice to the architect. We further represent that this shop drawing, product data or sample does not deviate from the requirements of the Contract Documents and that no revisions have been made hereto other than those requested by the Architect on previous submittals.

Approved by _____ Date _____

Review submittals and stamp with the above prior to submission to the Architect; Contractor's stamp shall bear the Contractor's name, the word "Approved", the signed initials of the approving agent, and the date of his approval action.

- B. Where work is indicated "By others", Contractor shall indicate responsibility for providing and coordinating such work in bold red letters.
- C. Submissions made without Contractor's Stamp and approval indicated thereon will be returned without being reviewed for compliance with this requirement.
- D. Date each submittal and indicate name of Project, Architect, Contractor, Sub-Contractor, as applicable, description or name of equipment, material or product and identify location at which it is to be used in the Work. Cross-reference to specific drawing and specification references.
- E. Each submittal must be numbered to match the section number in the specifications or submittal will be rejected. For Example a submittal for Pipe and tube railing must be numbered, "055213"
- E. Accompany submittal with transmittal letter containing project name, Contractor's name, number of samples or drawings, titles and other pertinent data. Transmittal shall outline deviations, if any, in submittals from requirements of Contract Documents.

1.06 ARCHITECT'S REVIEW AND APPROVAL:

- A. Architect's Review will be in accordance with the General Conditions.
- B. Architect will return only the following submittal data to the Contractor for his further reproduction and distribution.
1. ***Shop Drawings will be submitted through the general contractor's cloud based construction administration program such as Procore, Autodesk build, Project Trek, or similar. This service will be part of the project and will come at no cost to the owner or architect. The owner and architect will have full access to the cloud-based site from initial start to final acceptance. At the end of the project, all shop***

drawings will be downloaded by the contractor and 2 copies will be delivered to the architect at project closeout. (The copies must be submitted via USB Drive).

2. The architect and the owner reserve the right to request full size paper copies of any submittal along with color samples from the manufacturer. These will be delivered to the architect's office upon request.

1.07 RESUBMISSION:

- A. Make corrections and changes indicated for unapproved submissions and resubmit in same manner as specified above, until Architect's approval is obtained.
- B. In resubmission transmittal direct specific attention to revisions in bold red other than corrections requested by Architect on previous submissions, if any.
- C. Contractor shall be responsible for bearing all costs associated with the review and approval process of resubmitted (and/or substituted) submittal data.

1.08 DISTRIBUTION:

- A. Contractor is responsible for obtaining and distributing copies of submittals to his subcontractors and material suppliers after, as well as before, final approval. Prints of reviewed shop drawings shall be made from transparencies which carry the Architect's appropriate stamp.
- B. Contractor shall maintain a file of approved submittals for duration of project, which shall be delivered to Owner as a part of project close-out documents.
- C. The Contractor shall maintain a file of all approved submittals, bearing the Stamp of the Architect, at the project site. In the event the Architect or Owner should question the installation of any aspect of the work requiring approved submittal data, the inability of the Superintendent to produce the required approved submittal data upon demand shall constitute cause for a "stop work" order to be issued on that particular questioned aspect of the work and all relevant appurtenant work. The cause shall be equal to the Contractor's not having received required approval of the submittal data. If so issued, such "stop orders" shall not be considered valid justification for extensions of contract time and/or claims for additional monetary compensation.

1.09 SCHEDULE OF SUBMITTALS:

- A. The Contractor shall, within ten (10) calendar days following award of the Contract, submit his proposed schedule of submittals to the Architect for review.
- B. The purpose of the schedule is to:
 1. Demonstrate that all submittals, shop drawings, data, samples and mock-ups required for the Work are addressed by the Contractor.
 2. Demonstrate consistency with the Contractor's proposed Construction Schedule.
 3. Assist the Architect in scheduling timely review/approval action of submittals.
- C. The schedule shall contain the description of the submitted item, the proposed date of submittal and the proposed date of requested return by the Architect.
- D. After the Architect's receipt of the Contractor's submittal schedule, the Architect and the Contractor shall jointly review the schedule and mutually agree to acceptability or necessary modifications.

- E. Contractor shall submit his final accepted schedule within five (5) calendar days after the date of the joint review.

1.10 REQUESTS FOR INFORMATION (RFI's)

- A. Requests for Information may be incorporated into the cloud based project management solution noted above for submittals.

1.11 Notifications to Architect for Submittals and RFI's and general use of the cloud based project management system.

- A. Notifications from the cloud based project management system directly to the Architect or the Architect's consultants is strictly prohibited. Cloud Based project management system will only be allowed for sharing of submittals and RFI's between the design team and the contractor. The use of the cloud based project management system shall be the official means of responding to submittals and RFI's by the design team.

Contractor will upload Submittals and RFI's to the cloud based project management system and update the Excell submittal log and or RFI log accordingly. A single email notification from the contractor's project manager for the day's submittals and RFI's will be sent to the Architect and The appropriate log will be provided to the Architect at that time. **Items that are critical and requiring immediate attention will be handled by the Contractor Calling the Architect and making the Architect aware of the situation**, after the phone call has been conducted it will then and only then be the responsibility of the design team to respond to the critical item in the most expeditious manner based on the severity of the issue to be resolved and the formal response will be submitted to the online project management system as the official response. Also for Critical items that require phone notification, the contractor will immediately upon the end of the phone call have the critical item available for the Architect and Design team to respond to the critical item, i.e. the submittal or RFI must be generated in the online project management system.

- Daily notifications from the cloud based project management system are not preferred. Notifications should be given in the weekly meeting.
- Contractor will maintain all Submittal and RFI logs in an Excell Spread sheet.
- Submittal and RFI Logs will only be submitted to the Architect and the Architect's consultants **weekly** either on Friday at the close of business for the upcoming week or on Monday morning no later than 8:00am for the upcoming week and **not daily**.
- Contractor will prioritize deadlines for Submittals and RFI's subject to Critical Path and the goals for the immediate week ahead. The submittal schedule noted above will be required. A similar schedule shall be provided for RFI's as well.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. An independent Testing Laboratory will be provided by the Owner or his representative to inspect and test the materials and methods of construction as hereinafter specified for compliance with the specification requirements of the Contract Documents and to perform such other specialized technical services as may be required by the Owner or his representative.
- C. The Owner will pay for the initial laboratory services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will pay for testing and re-testing of materials that do not comply with the requirements of the Contract Documents.
- D. Tests and Inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials (ASTM) or other recognized and accepted authorities in the field.
- E. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.
- F. Related Requirements:

1.3 DEFINITIONS

- A. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

- B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- C. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer

conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups.
 - 1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
 - 2. Indicate manufacturer and model number of individual components.
 - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

1.9 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Retesting / Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
 1. Provide a factory field rep for the following:
 - a. Waterproofing/air barrier
 - b. Metal Roof
 - c. Painting (tech questions and paint thickness)
 - d. Flooring
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.
 2. REPAIR AND PROTECTION
- C. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- D. Protect construction exposed by or for quality-control service activities.
- E. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 00 TESTING LABORATORY SERVICES

PART ONE - GENERAL

1.01 DESCRIPTION:

- A. An independent Testing Laboratory will be provided by the Owner or his representative to inspect and test the materials and methods of construction as hereinafter specified for compliance with the specification requirements of the Contract Documents and to perform such other specialized technical services as may be required by the Owner or his representative.
- B. The Owner will pay for the initial laboratory services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will pay for testing and re-testing of materials that do not comply with the requirements of the Contract Documents.
- C. Tests and Inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials (ASTM) or other recognized and accepted authorities in the field.

1.02 QUALIFICATION OF LABORATORY:

- A. The Testing Laboratory selected should meet the basic requirements of ASTM E329 “Standard of Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction”, shall be inspected and approved by the ELF, FC & PA Joint Technical Committee, Inc. or by an equivalent recognized national authority and shall submit to the Owner, Architect, and the Engineer, a copy of the report of inspection of their facilities.
- B. The Testing Laboratory selected shall meet “Recommended Requirements for Independent Laboratory Qualification”, latest edition, as published by the “American Council of Independent Laboratory Qualification”.
- C. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants. The testing laboratory shall submit a copy of certificate of calibration made by an accredited calibration agency.
- D. The Testing Laboratory is only required to have testing facilities for work included in this project
- E. The agent of the Testing Laboratory performing field sampling and field testing of concrete shall be certified by the American Concrete Institute as a Concrete Field Testing Technician – Grade 1, or by an equivalent recognized national authority for an equivalent level of competence, or shall be a Licensed Professional Engineer.

1.03 AUTHORITIES AND DUTIES OF THE LABORATORY:

- A. The Testing Laboratory shall obtain and review the project plans and specifications with the Architect and Engineer two (2) weeks prior to the start of construction. The Laboratory shall

attend pre-construction conferences with the Architect, Engineer, Project Manager, General Contractor, and Material Suppliers, to coordinate materials inspection and testing requirements with the planned construction schedule. The Laboratory will participate in such conferences throughout the course of the project.

- B. The Testing Laboratory shall be responsible for outlining a written detailed testing program conforming to the requirements as specified in the Contract Documents and in consultation with the Owner, Architect, and Engineer. The testing program shall contain an outline of inspections and tests to be performed with reference to applicable sections of the specifications or drawings and a list of personnel assigned to each portion of the work. Such testing program shall be submitted to the Owner, Architect, and Engineer five (5) weeks in advance of the start of construction so as not to delay the start of construction. It shall be the Testing Laboratory's responsibility that such program conforms to the requirements of the Specifications and falls within the Owner's budget for testing laboratory services. If the allocated budget is not sufficient to cover the services as outlined in the Specifications, it shall be the responsibility of the Laboratory to notify the Architect, Engineer, and Owner, so the start of Laboratory services can be modified accordingly prior to the start of construction. Furthermore, the Testing Laboratory shall monitor its expenditures throughout the course of the job and notify immediately the Owner, Architect and Engineer, of any significant deviation from the planned testing program and budget.
- C. The Laboratory shall cooperate with the Architect, Engineer, and Contractor, and provide qualified personnel promptly on notice.
- D. The Laboratory shall perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents.
- E. The Laboratory shall notify the Architect and contractor first by telephone, and then in writing, of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.
- F. The Laboratory shall submit copies of all reports of inspections and test promptly and directly to the parties named below. All reports shall contain at least the following information:
 - 1. Project Name
 - 2. Date report issued.
 - 3. Testing Laboratory name and address.
 - 4. Name and signature of inspector.
 - 5. Date of inspection and sampling.
 - 6. Date of Test.
 - 7. Identification of product and Specification section.
 - 8. Location in the project.
 - 9. Identification of inspection or test.
 - 10. Record of weather conditions and temperature (if applicable).
 - 11. Results of test regarding compliance with Contract Documents.
- G. The Laboratory shall send certified copies of test and inspection reports to the following parties:
 - 1. Two (2) copies to the Owner or his representative.

2. Two (2) copies to the General Contractor.
 3. One (1) copy to the Architect.
 4. One (1) copy to the Engineer of responsibility
 5. One copy to the Supplier of the material tested.
- H. Upon completion of the job, the Testing Laboratory shall furnish to the Owner, Architect, and Engineer of responsibility, a statement certified by a Notary Public that all required tests and inspections were made in accordance with the requirements of the Contract Documents.
- I. The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.

1.04 CONTRACTOR'S RESPONSIBILITY:

- A. The Contractor shall cooperate with Laboratory personnel; provide access to the work, and to manufacturer's operations.
- B. The Contractor shall provide to the Laboratory representative, samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
- C. The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the Laboratory and otherwise facilitate all required inspections and tests.
- D. The Owner shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests. The Contractor shall coordinate with the owner on scheduling.
- E. The Contractor shall pay for any additional inspections, sampling, testing, and re-testing as required when initial tests indicate work does not comply with the requirements of the Contract Documents.
- F. The Contractor shall furnish and pay for the following items:
1. Soil survey of the location of borrowed soil materials, samples of existing soil materials, and delivery to the Testing Laboratory.
 2. Samples of concrete aggregates and delivery to the Testing Laboratory.
 3. Concrete Coring, tests of below-strength concrete, and load tests, if ordered by the Owner, Architect, and/or Engineer.
 4. Certification of reinforcing steel mill order.
 5. Certification of structural steel mill order.
 6. Certification of Portland cement.
 7. Certification of welders.
 8. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor, and the tests are necessary in the opinion of the Owner, Architect, or Engineer to establish equality with specified items.
 9. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.
- G. The Contractor shall be responsible for notifying the Owner, the Architect, the Engineer, and the Testing Laboratory when the source of any material is changed after the original tests or inspections have been made.

- H. If in the opinion of the Owner, Architect or Engineer, any of the work of the contractor is not satisfactory, the Contractor shall make all tests that the Owner, Architect, or Engineer deem advisable to determine its proper construction. The Owner shall pay all costs if the tests prove the questioned work to be satisfactory.

1.05 EXTENT OF SERVICES FOR EARTHWORK:

A. Moisture Density Relationship for Natural and Fill Materials:

1. The Testing Laboratory will provide one (1) optimum moisture density curve for each type of soil, natural, imported fill, or on-site fill, encountered in subgrade and fills under building slabs and paved areas. Curves shall be generated in accordance with ASTM D698.

B. Quality Control Testing Required During Construction:

1. The Testing Laboratory shall inspect and approve the following subgrades and fill layers before further construction work is performed there on:
 - a. Paved Areas and Building slab Subgrade: Make at least one (1) field density test of the natural density test of the natural subgrade for every 2,500 square feet of paved area or building slab, but in no case less than three (3) tests. In each compacted fill layer, make one (1) field density test for every 2,500 square of building slab on paved area, but in no case less than three (3) tests.
 - b. Foundation Wall Backfill: Make at least one (1) field density test for each 200 lineal feet of all with a minimum of four (4) tests for each basement wall around the perimeter of the building and a minimum of one (1) test for every other type of foundation wall on the site. Tests shall be at random locations and elevations for each wall.
2. Field Density Test shall be run according to ASTM D1556 (Density of Soil in Place by the Sand Cone Method), ASTM D2167 (Density of Soil in Place by the Rubber Balloon Method) or ASTM D2922 (Density of Soil and Soil Aggregate in Place by Nuclear Methods) as applicable.
3. The results of field density tests by the Testing Laboratory will not be considered satisfactory unless their value meet the required density.
4. The Testing Laboratory shall submit all moisture density curves and results of field density tests to the parties listed under Section 1.03G.
5. If reports by the Testing Laboratory indicate field densities lower than specified above, additional tests will be run by the Testing Laboratory with at least the frequencies scheduled above on re-compacted fill and/or natural subgrade. The Testing Laboratory shall notify the Contractor on a timely basis for any required re-testing so as not to delay the work. The costs of such tests shall be borne by the Contractor.
6. The Geotechnical Engineer shall provide inspection service of each dug footing subgrade prior to pouring foundation concrete. Such inspection shall verify that field conditions are consistent with soil report test results and that the foundation is being installed in the proper soil strata at the proper elevation.
The Geotechnical Engineer shall submit written field inspection reports promptly after inspection to all parties listed in 1.3 G, and report his findings after each inspection by telephone to the Structural Engineer.

1.06 EXTENT OF SERVICE FOR CONCRETE MATERIALS AND POURED IN-PLACE CONCRETE:

A. Concrete Test Cylinders:

1. Cylinders for strength tests shall be molded and laboratory cured in accordance with ASTM C31 "Method of Making and Curing Concrete Test Cylinders in the Field" and tested in accordance with ASTM C39 "Method of Testing for Compressive Strength of Cylindrical Concrete Specimens".
2. Field samples for strength tests shall be taken in accordance with ASTM C172 "Method of Sampling Fresh Concrete".
3. Frequency of Testing: Each set of test cylinders shall consist of a minimum of four (4) standard test cylinders. A set of test cylinders shall be made according to the following frequency:
 - a. One (1) set for each class of concrete taken not less than once a day.
 - b. For walls and floors, one (1) set for each 100 cubic yards or fraction thereof not less than one (1) set for each 5,000 square feet of surface area.
 - c. For columns, one (1) set for each 150 cubic yards or fraction thereof with a minimum of two (2) sets per floor.
 - d. For all other concrete, a minimum of one (1) set for each 100 cubic yards or fraction thereof.
 - e. No more than one (1) set of cylinders at a time shall be made from any single truck.
 - f. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five (5) strength tests for a given class of concrete, tests shall be made from at least five (5) randomly selected batches or from each batch if fewer than five batches are used.
 - g. The above frequencies assume that one (1) batch plant will be used for each pour. If more than one (1) batch plant is used, the frequencies cited above shall apply for each plant used.

The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded. Of the four (4) cylinders per set, break one at seven days, two at 28 days, and one automatically at 56 days if either 28 day cylinder break is below required strength. One (1) additional cylinder per set will be required for formed slab and pan joist floors for the purpose of evaluating the concrete strength at the time of form stripping.

The cylinder shall be stored on the floor where form removal is to occur under the same exposure conditions as the floor concrete.

This cylinder shall be cured under field conditions in accordance with ASTM C31 "Method of Making and Curing Concrete Test Specimen in the Field". Field cured test cylinders shall be molded at the same time and from the same samples as laboratory cured test specimens. This cylinder shall be broken at the time of form removal as directed by the Contractor.

4. For concrete with design strength in excess of 5,000 PSI, the Contractor shall be responsible for providing a temperature controlled and protected concrete cylinder storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory.

5. The Testing Laboratory shall be responsible for transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect will occur to the concrete cylinders.
6. The Testing Laboratory shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:
 - a. Truck number and ticket number.
 - b. Concrete Batch Plant
 - c. Mix design number.
 - d. Accurate location of pour in the structure.
 - e. Strength requirement.
 - f. Date cylinders made and broken.
 - g. Technician making cylinders.
 - h. Concrete temperature at placing.
 - i. Air temperature at point of placement in the structure.
 - j. Amount of water added to the truck at the batch plant and at the site.
 - k. Slump
 - l. Unit weight.
 - m. Air Content
 - n. Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven (7) day breaks are not to be flagged if they are less than 70% of the required 28 day strength. 28 day breaks are to be flagged if either cylinder fails to meet Specification requirements.

B. Other Tests of Concrete Required by the Testing Laboratory:

1. Slump tests (ASTM C143) shall be made at the beginning of concrete placement for each batch plant and for each set of test cylinders made.
2. Air entrainment (ASTM C233) tests shall be made at the same time slump tests are made as cited above.
3. Concrete Temperature at placement at the same time slump tests are made as cited above.

B. Evaluation and Acceptance of Concrete:

1. A strength test shall be defined as the average strength of two (2) 28-day cylinder breaks from each set of cylinders.
2. The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
 - a. The average of all sets of three (3) consecutive strength tests equal or exceed the required f'_c .
 - b. No individual strength tests (average of two (2) 28-day cylinder breaks) fall below the required f'_c by more than 500 PSI.
 - c. If either of the above requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone. Steps shall immediately be taken to increase the average of subsequent strength tests.

D. Investigation of Low Strength Concrete Test Results:

1. If any strength test of laboratory cured cylinders fall below the required f'_c by more than 500 PSI, the Contractor shall take steps immediately to assure that the load carrying capacity of the structure is not jeopardized.

2. The Testing Laboratory shall, under the direction of the Engineer, perform non-destructive field test of the concrete in question using Swiss Hammer, Windsor Probe, or other appropriate methods and report the results the same as for cylinder test reports.
 3. If the likelihood of low strength concrete is confirmed and computations indicate that the load carrying capacity of the structure has been significantly reduced, tests of cores drilled from the area in question under the direction of the Engineer will be required in accordance with ASTM C42 (Method of Obtaining and Testing Drilled Cores and Saws Beams of Concrete). In such case, three (3) cores shall be taken for each strength test more than 500 PSI below required f'_c . If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60° to 80°, relatively humidity less than 60 percent) for seven (7) days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 48 hours and tested wet. The Contractor shall fill all holes made by drilling cores with an approved dry-pack concrete.
 4. Concrete in an area represented by core test shall be considered structurally adequate if the average of three (3) cores is equal to at least 85% of f'_c and if no single core is less than 75% of f'_c . To check testing accuracy, locations of erratic core strengths may be re-tested.
 5. If the above criteria are not met, and the structure adequacy remains in doubt, the Engineer may order a load test, as specified in ACI 318 for the questionable portion of the structure.
 6. If the structural adequacy of the affected portion of the structure remains in doubt, the Engineer may order the structure to be strengthened by an appropriate means or torn down and re-built.
 7. The costs of all investigations of low strength concrete shall be borne by the Contractor.
- E. Job Site Inspection by the Testing Laboratory: The scope of the work to be performed by the inspector on the job site shall be as follows:
1. Verify that air temperatures at the point of placement in the structure are within acceptable limits defined in Section J prior to ordering of concrete by the Contractor.
 2. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.
 3. Inspect plastic concrete upon arrival at the job site to verify proper batching. The responsibility for adding water to trucks at the job site shall rest only with a duly appointed representative mutually agreeable to the Contractor, Owner, and Engineer, prior to the start of any concrete operations.
 4. Obtain concrete test cylinders as specified in Sections D.1 and D.2.
 5. Perform slump tests and air entrainment tests as specified in Section D.6.
 6. Record information for concrete test reports as specified in Section D.6
 7. Verify that all concrete being placed meets job Specifications. Reject concrete not meeting the requirements of Section K and immediately notify the Contractor, Batch Plant Inspector, Architect, Engineer, and Owner.
 8. Pick up and transport to Laboratory, cylinders cast the previous day.
 9. Check concrete placing techniques to determine that concrete deposited is uniform and that vertical drop does not exceed six feet.
 10. The job site inspector shall report any irregularities that occur in the concrete at the job site or test results to the Contractor, Architect, Owner, and Engineer.

F. Causes for Rejection of Concrete Delivered to the Site:

A duly appointed representative agreeable to the Architect, Owner, and Engineer, shall reject all concrete delivered to the site for any of the following reasons:

1. Wrong class of concrete (incorrect mix design number).
2. Air Temperature: Air temperature limits shall be as follows:
 - a. Cold Weather: Air temperature must be 40°F. and rising.
 - b. Hot Weather: Air temperature must be cooler than 100°F.
Concrete may be placed at other air temperature ranges only with approval to the duly appointed representative.
3. Concrete with temperatures exceeding 95° F. may not be placed in the structure without approval of the job inspector for the Testing Laboratory or other duly appointed representative.
4. Air contents outside the limits specified in the mix designs.
5. Slumps outside the limits specified in Section C.6 or the mix designs.
6. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Laboratory job inspector or other duly appointed representative.

1.07 EXTENT OF SERVICES FOR STRUCTURAL STEEL AND RELATED WORK:

A. Contract Obligations:

1. Owner Responsibility: The Owner shall pay for all initial shop and field inspections and tests are required during the fabrication and erection of the structural steel.
2. Contractor Responsibility: The Contractor shall pay for and arrange with the Testing Laboratory for the certification of all shop and field welders. The costs of all re-testing of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor.
3. The Fabricator and Erector shall provide: the laboratory inspector with access to all places where work is being done. A minimum of 24 hours notification shall be given prior to commencement of work.
4. Testing Laboratory Responsibility: The inspection of shop work by the Testing Laboratory shall be performed in the Fabricator's shop to the fullest extent possible. Such inspections shall be in sequence, timely, and performed in such a manner as to minimize disruptions in operations and to permit the repair of all non-conforming work while the materials in process in the fabricating shop. Inspection of field work shall be completed promptly so that corrections can be made without delaying the progress of the work. The Testing Laboratory shall provide test reports of all shop and field inspections. Shop test reports shall include shop welders' certifications.

All test reports shall indicate types and locations of all defects found during inspection, the measures required and performed to correct such defects, statements of final approval of all welding and bolting of shop and field connections. In addition to the parties listed in Section 1.03.G, the fabricator and erector shall receive copies of all test reports.

5. The Architect, Engineer, and Testing Laboratory reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspection.

B. Mill Tests of Structural Steel:

1. Mill Order Steel: The Fabricator shall furnish certified mill test reports and an affidavit stating that the structural steel furnished meets the requirements of the grade specified on the structural drawings for all mill order steel. In case of controversy, certified reports of tests, according to ASTM A6 or A568 as applicable, made by the Owner's Testing Laboratory, paid for by the Contractor, shall be made to verify conformity with ASTM standards.
2. Local Stock Steel: Materials taken from stock by a Fabricator for use for structural purposes must be of a quality at least equal to that required by the ASTM specifications applicable to the classification covering the intended use.
3. Certified mill test reports shall be accepted as sufficient record of the quality of materials carried in stock by the fabricator. In case of controversy, certified reports as specified for mill order steel shall be required.
4. If tests are required, test specimens shall be taken by the Contractor under the direction of the Testing Laboratory and shall be machined by the Testing Laboratory to dimensions as required by the applicable ASTM standards.

C. Shop Inspections and Tests:

The Testing Laboratory shall provide inspection at the designated fabrication shops for the designated periods of time to perform shop inspection and tests. The designated fabrication shops and time periods of inspections shall be determined in consultation with the Architect, Owner, and Engineer prior to the start of fabrication in a timely manner so as not to delay the fabrication process. The following tests and inspections shall be performed.

1. Review shop drawings and shop procedures with fabricator's supervisory personnel.
2. Review welding procedures and obtain welder certificates.
3. Verify welding electrodes to be used and other welding consumables as the job progresses.
4. Provide inspection of surface preparation for coating and coating operations.

D. Field Inspections and Tests:

The Testing Laboratory shall provide inspection in the field for a period of time as determined in consultation with the Architect, Owner, and Engineer prior to the start of erection in a timely manner so as to not delay the start of erection. The following tests and inspections shall be made:

1. Obtain the planned erection procedure, and review with the Erector's supervisory personnel.
2. Check the installation of base plates for proper leveling, grout type, and grout application.
3. Verify field welding procedures and obtain welder certificates.
4. Check steel as received in the field for possible shipping damage, workmanship, and piece marking.
5. Check plumbing and frame alignment as erection progresses.
6. Check required camber of floor beams.
7. Check joint preparation and fit up, backing strips, and run-out plates for welded moment connections and column splices.
8. Check pre-heating to assure proper temperature, uniformity, and thoroughness through the full material thickness.

9. Review welding sequence.
10. Visually inspect field welding for size, length, and quality.
11. Perform non-destructive examination services for various weldments of field erections determined in consultation with the Structural Engineer prior to the start of erection. The laboratory shall furnish a qualified technician with the necessary equipment to perform radiographic, ultrasonic, magnetic particle, or dye penetrant inspection as required for the item being tested and other duties as outlined for shop inspection in Section C.12.
12. Check calibration of impact wrenches used in field bolted connections.
13. Check high strength field bolted connections according to inspection procedures outlined in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts". Unless specified otherwise, test one (1) bolt in 10% of the bolted connections. If that bolt is found to be improperly tightened, test all bolts in the connection.
14. Visually inspect the welding of metal deck to the structure.
15. Perform field tests on 10% of completed shear connectors according to inspection procedures outlined in AWS D1.1.

END OF SECTION

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if

bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AABC - Associated Air Balance Council; www.aabc.com.
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 - 8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org
 - 9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 - 11. AF&PA - American Forest & Paper Association; www.afandpa.org.
 - 12. AGA - American Gas Association; www.aga.org.
 - 13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
 - 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 15. AI - Asphalt Institute; www.asphaltinstitute.org.
 - 16. AIA - American Institute of Architects (The); www.aia.org.
 - 17. AISC - American Institute of Steel Construction; www.aisc.org.
 - 18. AISI - American Iron and Steel Institute; www.steel.org.
 - 19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
 - 20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
 - 21. ANSI - American National Standards Institute; www.ansi.org.
 - 22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.

23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPAA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformance Européenne; <http://ec.europa.eu/growth/single-market/ce-marking/>
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - Canadian Standards Association; www.csa.ca.
65. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.

68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsintstitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarooft.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. IAS - International Approval Services; (See CSA).
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.

113. ILI - Indiana Limestone Institute of America, Inc.; www.ili.ai.com.
114. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
115. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
116. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
117. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
118. ISO - International Organization for Standardization; www.iso.org.
119. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
120. ITU - International Telecommunication Union; www.itu.int/home.
121. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
122. LMA - Laminating Materials Association; (See CPA).
123. LPI - Lightning Protection Institute; www.lightning.org.
124. MBMA - Metal Building Manufacturers Association; www.mbma.com.
125. MCA - Metal Construction Association; www.metalconstruction.org.
126. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
127. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
128. MHIA - Material Handling Industry of America; www.mhia.org.
129. MIA - Marble Institute of America; www.marble-institute.com.
130. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
131. MPI - Master Painters Institute; www.paintinfo.com.
132. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
133. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
134. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
135. NADCA - National Air Duct Cleaners Association; www.nadca.com.
136. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
137. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
138. NBI - New Buildings Institute; www.newbuildings.org.
139. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
140. NCMA - National Concrete Masonry Association; www.ncma.org.
141. NEBB - National Environmental Balancing Bureau; www.nebb.org.
142. NECA - National Electrical Contractors Association; www.necanet.org.
143. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
144. NEMA - National Electrical Manufacturers Association; www.nema.org.
145. NETA - InterNational Electrical Testing Association; www.netaworld.org.
146. NFHS - National Federation of State High School Associations; www.nfhs.org.
147. NFPA - National Fire Protection Association; www.nfpa.org.
148. NFPA - NFPA International; (See NFPA).
149. NFRC - National Fenestration Rating Council; www.nfrc.org.
150. NHLA - National Hardwood Lumber Association; www.nhla.com.
151. NLGA - National Lumber Grades Authority; www.nlga.org.
152. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
153. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
154. NRCA - National Roofing Contractors Association; www.nrca.net.
155. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.

156. NSF - NSF International; www.nsf.org.
157. NSPE - National Society of Professional Engineers; www.nspe.org.
158. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
159. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
160. NWFA - National Wood Flooring Association; www.nwfa.org.
161. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
162. PDI - Plumbing & Drainage Institute; www.pdionline.org.
163. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); <http://www.plasa.org>.
164. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
165. RFCI - Resilient Floor Covering Institute; www.rfci.com.
166. RIS - Redwood Inspection Service; www.redwoodinspection.com.
167. SAE - SAE International; www.sae.org.
168. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
169. SDI - Steel Deck Institute; www.sdi.org.
170. SDI - Steel Door Institute; www.steeldoor.org.
171. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
172. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
173. SIA - Security Industry Association; www.siaonline.org.
174. SJI - Steel Joist Institute; www.steeljoist.org.
175. SMA - Screen Manufacturers Association; www.smainfo.org.
176. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
177. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
178. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
179. SPIB - Southern Pine Inspection Bureau; www.spib.org.
180. SPRI - Single Ply Roofing Industry; www.spri.org.
181. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
182. SSINA - Specialty Steel Industry of North America; www.ssina.com.
183. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
184. STI - Steel Tank Institute; www.steeltank.com.
185. SWI - Steel Window Institute; www.steelwindows.com.
186. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
187. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
188. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
189. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
190. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
191. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
192. TMS - The Masonry Society; www.masonrysociety.org.
193. TPI - Truss Plate Institute; www.tpinst.org.
194. TPI - Turfgrass Producers International; www.turfgrasssod.org.
195. TRI - Tile Roofing Institute; www.tilerroofing.org.
196. UL - Underwriters Laboratories Inc.; <http://www.ul.com>.
197. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
198. USAV - USA Volleyball; www.usavolleyball.org.
199. USGBC - U.S. Green Building Council; www.usgbc.org.
200. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
201. WASTEC - Waste Equipment Technology Association; www.wastec.org.

202. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 203. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 204. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 205. WI - Woodwork Institute; www.wicnet.org.
 206. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 207. WWPA - Western Wood Products Association; www.wwpa.org.
- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 3. ICC - International Code Council; www.iccsafe.org.
 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 5. DOE - Department of Energy; www.energy.gov.
 6. EPA - Environmental Protection Agency; www.epa.gov.
 7. FAA - Federal Aviation Administration; www.faa.gov.
 8. FG - Federal Government Publications; www.gpo.gov/fdsys.
 9. GSA - General Services Administration; www.gsa.gov.
 10. HUD - Department of Housing and Urban Development; www.hud.gov.
 11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
 12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 13. SD - Department of State; www.state.gov.
 14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
 18. USP - U.S. Pharmacopeial Convention; www.usp.org.
 19. USPS - United States Postal Service; www.usps.com.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and

regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCC - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 6. MILSPEC - Military Specification and Standards; (See DOD).
 7. USAB - United States Access Board; www.access-board.gov.
 8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 3. CDHS; California Department of Health Services; (See CDPH).
 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforests-service.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 TEMPORARY FACILITIES

PART ONE - GENERAL

1.01 FACILITIES:

- A. Temporary Offices: Provide sufficient space for Contractor's personnel.
 - 1. Provide temporary office facilities complete with lighting, heating and air conditioning and telephone service.
 - 2. Location of temporary office shall be subject to Architect's acceptance.
- B. Temporary Storage Facilities: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces. Locations and adequacy of storage facilities shall be subject to Architect's approval.
- C. Electrical Service: Provide temporary electrical service, including extensions and connections necessary for construction work. Pay costs of installing and maintaining service for duration of project. Pay costs associated with use of permanent electrical system until Date of Substantial Completion.
- D. Temporary Lighting: Provide the following minimum light levels for construction purposes.
 - 1. General Construction and Safety Lighting: Five (5) footcandles.
 - 2. Finishing Work and Testing: twenty-five (25) footcandles.
- E. Temporary Heat and Ventilation:
 - 1. Provide temporary heat in enclosed spaces to provide minimum temperatures of 40°F. until time finishing work begins.
 - 2. After building is totally enclosed and installation of finishes begins, maintain spaces in a temperature range of 60°F. to 80°F. at all times, except as may otherwise be required by product manufacturers for proper product installation and performance. Maintain until Date of Substantial Completion.
 - 3. Maintain relative humidity in a range of 50% to 65% in enclosed spaces after building is enclosed and installation of finishes begin; except as may otherwise be required by product manufacturers for proper product installation and performance.
 - 4. Provide ventilation to prevent accumulation of dust, fumes or gases and to properly cure materials and disperse humidity.
- F. Telephone Service: Provide temporary telephone service to temporary offices for duration of project. Pay costs for installation and for local services. Toll calls shall be paid for by person making call.
- G. Internet / Data Service: Provide temporary internet / data service to temporary offices for duration of project. Pay costs for installation and for local services.
- H. Water Service: Provide temporary water for construction purposes, including extensions and connections necessary for work. Pay costs of installation and maintaining service for duration of project. Pay costs associated with use of permanent water system until Date of Substantial Completion.
- I. Sanitary Toilet Facilities: Provide and maintain temporary toilet facilities for construction personnel. Permanent new facilities may not be used by personnel. During work at existing facilities, under no circumstances will workmen be allowed to use any toilet facility within the building.
- J. Relocate temporary facilities during construction as required by progress of the Work at no additional cost to the Owner.

- K. Where work is performed with-in an existing building, water, electrical and gas will be paid for by the owner (where possible to use convenience outlets with-in the building without disturbing normal operations).
- L. At completion of Work, or at time of permanent utility connections, as applicable, remove temporary facilities, including connections and debris resulting from temporary installation.

1.02 STAGING AREA:

- A. The Contractor shall be responsible for establishing staging areas WITHIN the designated Limit of Work area for this Contract; no staging or materials storage will be permitted outside the Limit of Work area.
- B. The Contractor is solely responsible for all security, protection, safeguards, etc. of materials and personnel within the established staging area (areas).

1.03 TEMPORARY CONTROLS:

- A. Noise Control: Contractor shall make every effort to affect a satisfactory noise abatement program.
- B. Dust Control: Where cutting or removing materials which will generate dust and dirt, the Contractor shall provide temporary dust curtains, solid barricades, or the like, to retain and control dust relative to the area in which work is occurring. Clean areas of dust as practicable so as not to allow its spread by pedestrian traffic.

1.04 CONTRACTOR'S USE OF PREMISES: The Contractor is reminded that the Project is limited by its nature to certain physical areas of each facility. The facilities may be fully occupied (except as provided for work areas) while the work progresses. Therefore, restrict personnel to areas of each facility where their presence is required by the work to be performed.

1.05 PROJECT SIGNS:

- A. Contractor will coordinate placement with the Project Manager.
- B. **The Contractor shall provide, furnish, and install 4'x8' project sign with graphics provided by the Architect. The sign will be located near the entrance driveway to the school along LA-1.**

END OF SECTION

SECTION 01 53 00 - TEMPORARY SECURITY FENCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

- A. Site Plan: Show temporary security facilities, staging areas, and parking areas for construction personnel.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Temporary Fence Panels: Minimum 2-inch x 6-inch galvanized wire mesh inset, 6'-6" high by 11'-4" long panels constructed from 1-3/8" pipe frame with .065 wall thickness. Provide 1-3/8" x 1-3/8" panel clamps as required.

PART 3 - EXECUTION

3.1 SECURITY FENCING INSTALLATION

- A. Site Enclosure Fence: Before construction operations begins, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates. The entrances will be locked after hours.
 - 1. Extent of Fence: As required to enclose entire Project site As indicated on Drawings.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

END OF SECTION 01 53 00

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 014200 "References" for applicable industry standards for products specified.
 - 4. Section 017700 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements

for purposes of evaluating comparable products of additional manufacturers named in the specification. **Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.**

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.

e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.4 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
 1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.
 4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 7. Protect stored products from damage and liquids from freezing.
 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections are to be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty (where called for in individual specification sections): Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form (where called for in individual specification sections): When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

- a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.

B. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will not** be considered **unless otherwise indicated**.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
2. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will not** be considered **unless otherwise indicated**.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within **seven** days of receipt of a request for a comparable product. Architect will notify Contractor[of approval or rejection of proposed comparable product within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.
1. Architect's Approval of Submittal: **Marked with approval notation from Architect's action stamp.** See Section 013300 "Submittal Procedures."
 2. If contractor fails to provide sufficient evidence to the Architect as noted in paragraph A above, the Architect may reject the submittal via email notification only. The Architect is the only one who will deem whether or not sufficient evidence has been provided, no exceptions. Specified products must be used if architect elects to reject the submittal in this manner.
 3. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 01 64 00 - PRODUCT HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

Except as otherwise approved by the Architect, determine and comply with manufacturers' recommendations on product handling, storage, and protection.

1.4 PACKAGING

- A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
 - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
 - 2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- B. The Architect may reject as non-complying such material and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION

- A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.
- B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 REPAIRS AND REPLACEMENTS

- A. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION 01 64 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for limits on use of Project site.
 - 2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
 - 3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor or professional engineer.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two 2 permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

- E. Final Slab Elevation: Engage a land surveyor to prepare a final certificate of elevation.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 01 77 00 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Legally dispose of all waste in accordance to local authorities having jurisdiction.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."

- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
- B. Allowances: Furnish demonstration and training instruction time under the demonstration and training allowance.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Information: Submit two 2 copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Construction Manager.
 - d. Name of Contractor.

2. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.

- c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
- 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.

8. Repairs: Include the following:

- a. Diagnosis instructions.
- b. Repair instructions.
- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner through Owner's Project Manager with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 79 00

DIVISION 02
EXISTING CONDITIONS

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of interior of building.
2. Demolition and removal of existing buildings in their entirety
3. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

- A. Remove:** Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage:** Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.
- C. Remove and Reinstall:** Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.
- D. Existing to Remain:** Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.**
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.**
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at **Project site, conference may be included as part of the preconstruction conference for the project.**
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.
 - 6. Review and finalize protection requirements.
 - 7. Review procedures for **noise control and dust control.**
 - 8. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Temporary interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials:
 - 1. It is expected that hazardous materials will be encountered in the Work.
 - a. Hazardous materials will be removed by the contractor, Hazardous Materials reports will be provided by the owner.
 - b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- B. **Engage a professional engineer to perform** an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video. Comply with Section 013233 "Photographic Documentation."

1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

- A. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.
- B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

- A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.
 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 2. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.

3. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.
4. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.
 - a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
5. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:
 - a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.
 - b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

3.4 SALVAGE/REINSTALL

A. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area **designated by Owner during the preconstruction conference**
5. Protect items from damage during transport and storage.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain fire watch during and for at least 12 hours after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete:
1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least **3/4 inch (19 mm)** at junctures with construction to remain. Dislodge concrete from

reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

2. Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

DIVISION 03
CONCRETE

SECTION 03 33 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Grade Beams
 - 2. Slabs-On-Grade
 - 3. Pile Caps

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
- E. Qualification Data: For testing agency.
- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
- G. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.

2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

H. Field quality-control test and inspection reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following at contractor's discretion:
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: Per ACI 318 limitations related to spacing of steel reinforcement, depth of slab or thickness of concrete member.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 1/2-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 WATERSTOPS

- A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).

1. Products:

- a. Deneef Construction Chemicals; Swellseal.
- b. Greenstreak; Hydrotite.
- c. Mitsubishi International Corporation; Adeka Ultra Seal.
- d. Progress Unlimited, Inc.; Superstop.

2.8 VAPOR RETARDERS

- A. Plastic Vapor Retarder: Refer to architectural specifications.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products:

- a. Axim Concrete Technologies; Cimfilm.
- b. Burke by Edoco; BurkeFilm.
- c. ChemMasters; Spray-Film.
- d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
- e. Dayton Superior Corporation; Sure Film.
- f. Euclid Chemical Company (The); Eucobar.
- g. Kaufman Products, Inc.; Vapor Aid.
- h. Lambert Corporation; Lambco Skin.
- i. L&M Construction Chemicals, Inc.; E-Con.
- j. MBT Protection and Repair, Div. of ChemRex; Confilm.
- k. Meadows, W. R., Inc.; Sealtight Evapre.
- l. Metalcrete Industries; Waterhold.
- m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
- n. Sika Corporation, Inc.; SikaFilm.
- o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
- p. Unitex; Pro-Film.
- q. US Mix Products Company; US Spec Monofilm ER.
- r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

- B. Water: Potable.

- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor coverings.

1. Products:

- a. Anti-Hydro International, Inc.; AH Clear Cure WB.
- b. Burke by Edoco; Spartan Cote WB II.
- c. ChemMasters; Safe-Cure & Seal 20.
- d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
- e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
- f. Euclid Chemical Company (The); Aqua Cure VOX.
- g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
- h. Lambert Corporation; Glazecote Sealer-20.
- i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
- j. Meadows, W. R., Inc.; Vocomp-20.
- k. Metacrete Industries; Metcure.
- l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
- m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
- n. Tamms Industries, Inc.; Clearseal WB 150.
- o. Unitex; Hydro Seal.
- p. US Mix Products Company; US Spec Hydrasheen 15 percent
- q. Vexcon Chemicals, Inc.; Starseal 309.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit the water-cementitious materials (w/cm) ratio in concrete for floors to receive moisture-sensitive flooring to no higher than 0.45.
- C. Cementitious Materials: Percentages, by weight, of cementitious materials other than portland cement in concrete shall be determined by the concrete supplier to maximize the amount of recycled material in the concrete while controlling workability, setting time, rate of strength gain, and other properties to facilitate construction operations.

1. Cementitious materials other than portland cement shall make up a minimum of 15 percent of the total cementitious materials in any mix.
 2. Limit cementitious materials other than portland cement to no more than 20 percent of the total cementitious materials in floor slabs to receive moisture-sensitive flooring.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Refer to the Structural Notes on the Structural Drawings for Usage, Concrete 28-day Compressive Strength, Slump, Air Content, and Maximum Aggregate Size.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Form vertical faces of all footings, stem walls and pilasters.
- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- D. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- E. Construct forms tight enough to prevent loss of concrete mortar.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- 3.2 EMBEDDED ITEMS
- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slab-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Water-reducing admixture, high-range water-reducing admixture or plasticizer may be added during batching or at the Project site to the dosage specified in the mix design. Follow manufacturer's recommendations for timing of addition, dosage, and mixing requirements prior

to placement. Samples for quality assurance tests shall be obtained after admixture addition and additional mixing in accordance with ASTM C 94.

- C. Water is permitted to be added to a batch of concrete at the Project site before placement provided that the amount of water added does not exceed the allowed amount indicated on the delivery ticket. Water addition shall only be permitted before any portion of the load is discharged. Samples for quality assurance tests shall be obtained after water addition and additional mixing in accordance with ASTM C 94.
 - 1. Do not add water to concrete after plasticizing or high-range water-reducing admixtures are added to the concrete at the Project site.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view or to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots.

Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
 - 1. In areas to receive flooring or cementitious toppings, after curing period has elapsed, remove evaporation retarder without damaging concrete surfaces by bead blasting to a surface profile of CSP 2 or other method as recommended by flooring or topping manufacturer.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall

within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

- a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s). For joints under flooring, defer joint filling until ready to begin flooring installation. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match

- before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Design/Built Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Design/Built Architect's approval.
- 3.15 FIELD QUALITY CONTROL
- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Headed bolts and studs.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
 - 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture. The provisions of ASTM C 94/C 94M shall apply for acceptance of air content of concrete.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Concrete Density: ASTM C 138/C 138M; one test for each composite sample.
 - 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 - 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 - 9. Test results shall be reported in writing to Design/ Built Architect, concrete manufacturer, and Design/Built Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement,

- name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Design/Built Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Design/Built Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Design/Built Architect.
 12. Additional testing and inspecting, at Design/Built Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 03 33 00

SECTION 033810 - POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Furnishing post-tensioning reinforcement and accessories including prestressing tendons, pocket formers, support bars, bar chairs, and slab bolsters.
 - 2. Installing post-tensioning tendons.
 - 3. Performing post-tensioning operations including stressing and finishing tendons.
 - 4. Recording tendon elongations and gage pressures.
 - 5. Finishing tendon ends and patching stressing pockets.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for cast-in-place concrete, steel reinforcement, placement of nonprestressed steel reinforcement, and concrete strength testing of laboratory- and field-cured cylinders.

1.3 DEFINITIONS

- A. Strand Tail: Excess strand length extending past the anchorage device.
- B. Stressing Blockout: Opening created in the slab to allow access to stressing-end anchorages.
- C. Stressing Pocket: Void formed by pocket former at stressing-end anchorage to provide required cover over wedges and strand tail.
- D. Wedge Cavity: Cone-shaped hole in anchorage device designed to hold the wedges that anchor the strand.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design cast-in-place, post-tensioned concrete reinforcement as indicated in this Section. Show final effective forces, tendon profiles, and nonprestressed reinforcement on design Shop Drawings.
- B. Employ professional Engineer, registered in Louisiana, and acceptable to Owner, to perform design. Sign and seal design Shop Drawings and design calculations submitted to Owner for review. Prepare and seal drawings and calculations for submittal to authorities having jurisdiction. Comply with design intent, criteria, and requirements of the Contract Documents.

- C. Comply with ACI 318 limits on stresses at transfer of prestress and under service load.
- D. Comply with ACI 318 requirements for concrete cover over reinforcement.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Post-tensioning coating.
 - 2. Tendon sheathing.
 - 3. Anchorage devices.
 - 4. Tendon couplers.
 - 5. Bar and tendon supports.
 - 6. Pocket formers.
 - 7. Sheathing repair tape.
 - 8. Stressing-pocket patching material.
 - 9. Stamped post tension engineered shop drawings by a licensed professional in the state of Louisiana.
- B. Shop Drawings: Installation drawings including plans, elevations, sections, details, and notes prepared by or under the supervision of a registered professional engineer detailing tendon layout and installation procedures, including the following:
 - 1. Numbers, arrangement, and designation of post-tensioning tendons.
 - 2. Tendon profiles and method of tendon support including chair heights and locations. Show tendon profiles at sufficient scale to clearly indicate all support points, with their associated heights.
 - 3. Construction joint locations, pour sequence, locations of anchorages and blockouts required for stressing.
 - 4. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
 - 5. Sealed calculations prepared by a registered structural engineer indicating method of elongation calculation including values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, and shrinkage.
 - 6. Calculated elongations for each tendon.
 - 7. Details for horizontal curvature around openings and at anchorages.
 - 8. Details for corners and other locations where tendon layouts may conflict with one another or nonprestressed reinforcing steel.
 - 9. Diagrams and notes as necessary for positioning of nonprestressed reinforcement required for installing post-tensioning tendons including, but not limited to, the following:
 - a. Support bars.
 - b. Backup bars and hairpins at anchorages.
 - c. Hairpins at locations of horizontal curvature.
 - d. Supplemental reinforcement at blockouts.
- C. Design Shop Drawings and calculations.
- D. Product Certificates:
 - 1. For each type of anchorage device and coupler, signed by product manufacturer.

2. For each type of encapsulation system, signed by product manufacturer.
- E. Mill Test Reports: Certified mill test reports for prestressing strand used on Project indicating that strand is low-relaxation and including the following:
1. Coil numbers or identification.
 2. Breaking load.
 3. Load at 1 percent extension.
 4. Elongation at failure.
 5. Modulus of elasticity.
 6. Diameter and net area of strand.
- F. Field quality-control test reports.
- G. Procedures Statement: Procedures for cutting excess strand tail and patching stressing pocket.
- H. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.
- I. Stressing Records: Filled out by testing agency during stressing operation with the following information recorded:
1. Name of Project.
 2. Date of approved installation drawings used for installation and stressing.
 3. Floor number and concrete placement area.
 4. Date of stressing operation.
 5. Weather conditions including temperature and rainfall.
 6. Name and signature of inspector.
 7. Name of individual in charge of stressing operation.
 8. Serial or identification numbers of jack and gage.
 9. Date of jack-and-gage calibration certificates.
 10. Gage pressure to achieve required stressing force per supplied calibration chart.
 11. Tendon identification mark.
 12. Calculated tendon elongation.
 13. Actual tendon elongation.
 14. Actual gage pressure.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 - Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to Architect.
1. Superintendent must have received training from post-tensioning supplier in the operation of stressing equipment to be used on Project.
- B. Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."
- C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Testing Agency Inspector: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 - Field Fundamentals course or shall have equivalent qualifications acceptable to Architect.
- D. Source Limitations: Obtain post-tensioning materials and equipment from the same supplier.
 1. Stressing jacks not provided by post-tensioning supplier must be calibrated and approved for use on Project by post-tensioning supplier.
- E. ACI Publications: Comply with ACI 423.6, "Specification for Unbonded Single Strand Tendons," unless otherwise indicated in the Contract Documents.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to installation and stressing of post-tensioning tendons including, but not limited to, the following:
 1. Construction schedule and availability of materials, personnel, and equipment needed to make progress and avoid delays.
 2. Storage of post-tensioning materials on-site.
 3. Structural load limitations.
 4. Coordination of post-tensioning installation drawings and nonprestressed reinforcing steel placing drawings.
 5. Horizontal and vertical tolerances on tendon and nonprestressed reinforcement placement.
 6. Marking and measuring of elongations.
 7. Submittal of stressing records and requirements for tendon finishing.
 8. Removal of formwork.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Inspect tendons and accessory items at time of their delivery to Project site, prior to off-loading. Notify post-tensioning supplier of observed damage prior to off-loading.
- C. Keep accurate and current records of materials delivered and used.
- D. Immediately remove from Project site any tendons with damaged strand.

1.8 COORDINATION

- A. Attachments and Penetrations:
 1. Attach permanent fixtures such as curtain-wall systems, handrails, fire-protection equipment, lights, and security devices to the slab using embedded anchors. Drilled anchors are not allowed unless authorized in writing by Architect.
 2. Power-driven fasteners are not allowed unless authorized in writing by Architect.
 3. Core drilling for sleeves or other penetrations is not allowed unless authorized in writing by Architect.

4. Protect penetrations within [18 inches (460 mm)] <Insert value> of an anchorage with ASTM A 53/A 53M, Schedule 40 steel pipe.

PART 2 - PRODUCTS

2.1 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416, Grade 270, uncoated, 7-wire, low-relaxation, 0.5-inch-diameter strand.
- B. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties specified in ACI 423.6; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.
 1. Minimum Coating Weight: 2.5 lb for 0.5-inch-diameter strand per 100 feet of strand.
 2. Completely fill annular space between strand and sheathing over entire tendon length with post-tensioning coating.
- C. Tendon Sheathing: Comply with ACI 423.6.
 1. Minimum Thickness: 0.050 inch for polyethylene or polypropylene with a minimum density of 0.034 lb/cu. in.
 2. Continuous over the entire length of tendon between anchorages to prevent intrusion of cement paste or loss of coating for a non-encapsulated system.
- D. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements in ACI 423.6 and capable of developing 95 percent of actual breaking strength of strand.
 1. Anchorage Bearing Stresses: Comply with ACI 423.6 for stresses at transfer load and service load.
 2. Fixed-End Anchorage Device Assemblies: Plant fabricated with wedges seated at a load of not less than 80 percent and not more than 85 percent of breaking strength of strand.
- E. Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:
 1. Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.
 - a. Caps for Fixed and Stressing-End Anchorages Devices: Designed to provide watertight encapsulation of wedge cavity. Sized to allow required extension of strand past the wedges.
 - 1) Attach cap for fixed-end anchorage device in fabricating plant.
 - b. Caps at Intermediate Anchorages: Open to allow passage of strand.
 2. Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of 4 inches with sheathing and completely filled with post-tensioning coating.

2.2 NONPRESTRESSED STEEL BARS

- A. Support Bars, Reinforcing Bars, Hairpins: ASTM A 615, Grade 60, deformed. Minimum support bar size is 1/2 inch.
- B. Low-Alloy-Steel Support Bars, Reinforcing Bars, Hairpins: ASTM A 706, deformed.
- C. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons and tendon support bars in place. Manufacture bar supports, according to CRSI's "Manual of Standard Practice," from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. For uncoated bars, use CRSI Class 1 plastic-protected bar supports.

2.3 ACCESSORIES

- A. Pocket Formers: Capable of completely sealing wedge cavity; sized to provide the required cover over the anchorage and allow access for cutting strand tail.
- B. Anchorage Fasteners: Uncoated steel nails, wires, and screws used to attach anchorage devices to formwork.
- C. Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of 2 inches, in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Adhesive Tape Products, Inc.; PWT-20.
 - b. 3M; Tape 226.
 - c. Tyco Adhesives; Polyken 826.

2.4 PATCHING MATERIAL

- A. Patching Material: One component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead application. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Verticoat Supreme.
 - b. Fox Industries, Inc.; FX-228.
 - c. Kaufman Products, Inc.; Patchwell Kit HB.
 - d. Master Builders, Inc.; Emaco R350 CI.
 - e. Sika Corporation, Inc.; SikaMonoTop 612.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Provide formwork for post-tensioned elements as specified in Division 3 Section "Cast-in-Place Concrete." Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.
- B. Do not remove forms supporting post-tensioned elements until tendons have been fully stressed and elongations have been approved by Architect, unless authorized in writing by Architect.
- C. Do not place concrete in supported floors until tendons on supporting floors have been stressed and elongations have been approved by Architect, unless authorized in writing by Architect.

3.2 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

- A. Placement of nonprestressed steel reinforcement is specified in Division 3 Section "Cast-in-Place Concrete." Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

3.3 TENDON INSTALLATION

- A. Install tendons according to approved installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of 42 inches o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.
 - 1. Support tendons as required to provide profiles shown on installation drawings. Position supports at high and low points and at intervals not exceeding 48 inches. Ensure that tendon profiles between high and low points are smooth parabolic curves.
 - 2. Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
 - 3. Support slab tendons independent of beam reinforcement.
- C. Maintain tendon profile within maximum allowable deviations from design profile as follows:
 - 1. 1/4 inch for member depth less than or equal to 8 inches.
 - 2. 3/8 inch for member depth greater than 8 inches and less than or equal to 24 inches.
 - 3. 1/2 inch (13 mm) for member depth greater than 24 inches.
- D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of 2 inches of separation between tendons at locations of curvature.
- E. Limit tendon bundles to five tendons. Do not twist or entwine tendons within a bundle. Maintain a minimum distance of 12 inches between center of adjacent bundles.

- F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs unless changes are authorized in writing by Architect. Obtain Architect's approval before relocating tendons or tendon anchorages that interfere with one another.
- G. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.
- H. Installation of Anchorage Devices:
 - 1. Place anchorage devices at locations shown on approved installation drawings.
 - 2. Do not switch fixed and stressing-end anchorage locations unless authorized in writing by Architect.
 - 3. Attach pocket formers, intermediate anchorage devices, and stressing-end anchorage devices securely to bulkhead forms. Install stressing-end and intermediate anchorage devices perpendicular to tendon axis.
 - 4. Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches behind stressing-end and intermediate anchorages.
 - 5. Embed intermediate anchorage devices at construction joints in first concrete placed at joint.
 - 6. Minimum splice length in reinforcing bars at anchorages is 24 inches. Stagger splices a minimum of 60 inches.
 - 7. Place fixed-end anchorage devices in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
 - 8. Remove loose caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach caps to achieve a watertight enclosure.
- I. Maintain minimum concrete cover as follows:
 - 1. From Exterior Edge of Concrete to Wedge Cavity: 2 inches.
 - 2. From Exterior Edge of Concrete to Strand Tail: 3/4 inch.
 - 3. From Exterior Edge of Concrete to Wedge-Cavity Cap: 1 inch.
 - 4. Top, Bottom, and Edge Cover for Anchorage Devices: 1-1/2 inches.
- J. Maintain minimum clearance of 6 inches between tendons and openings.
- K. Prior to concrete placement, mark tendon locations on formwork with spray paint.
- L. Do not install sleeves within 36 inches of anchorages after tendon layout has been inspected unless authorized in writing by Architect.
- M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected unless authorized in writing by Architect.
- N. Do not use couplers unless location has been approved by Architect.

3.4 SHEATHING INSPECTION AND REPAIR

- A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.
 - 1. Ensure that sheathing is watertight and there are no air voids.
 - 2. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

- B. Maximum length of exposed strand behind anchorages is as follows:
 - 1. Fixed End: 12 inches.
 - 2. Intermediate and Stressing End: 1 inch.
 - a. Cover exposed strand with sheathing repair tape to prevent contact with concrete.
- C. Immediately remove and replace tendons that have damaged strand.

3.5 CONCRETE PLACEMENT – IF A TOP COAT CURING AGENT IS USED, ENSURE THAT IS HAS BEEN ETCHED OFF AND SURFACE APPROVED BY PAINTING MANUFACTURER BEFORE PAINTING BASKETBALL COURT LINES. THE SLAB MUST CURE FOR 28 DAYS BEFORE PAINTING.

- A. Do not place concrete until placement of tendons and nonprestressed steel reinforcement has been inspected by testing agency.
- B. Provide Architect and testing agency a minimum of 48 hours' notice before concrete placement.
- C. Place concrete as specified in Division 3 Section "Cast-in-Place Concrete." Ensure compaction of concrete around anchorages.
- D. Ensure that position of tendon and nonprestressed steel reinforcement does not change during concrete placement. Reposition tendons and nonprestressed steel reinforcement moved during concrete placement.
- E. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete placing equipment on tendons.

3.6 TENDON STRESSING

- A. Calibrate stressing jacks and gages at start of job and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site and available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.
- B. Stress tendons only under supervision of qualified post-tensioning superintendent.
- C. Do not begin stressing operations until concrete strength has reached 3000 psi as indicated by compression tests of field-cured cylinders.
- D. Complete stressing within 96 hours of concrete placement.
- E. If concrete has not reached required strength, obtain Architect's approval to partially stress tendons and delay final stressing until concrete has reached required strength.
- F. If detensioning and restressing of tendon is required, discard wedges used in original stressing and provide new wedges.
- G. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8 inch.

- H. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of Architect.
- I. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.
- J. If measured elongations deviate from calculated elongations by more than 7 percent, additional testing, restressing, strengthening, or replacement of affected elements may be required.

3.7 TENDON FINISHING

- A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Architect.
- B. Cut strand tails as soon as possible after approval of elongations.
- C. Cut strand tail between 1/2 and 3/4 inch from wedges. Do not damage tendon or concrete during removal of strand tail. Acceptable methods of cutting strand tail include the following:
 - 1. Oxyacetylene flame.
 - 2. Abrasive wheel.
 - 3. Hydraulic shears.
 - 4. Plasma cutting.
- D. Install caps and sleeves on intermediate anchorages within one day of stressing.
- E. Cut strand tails and install caps on stressing-end anchorages within one day of Architect's acceptance of elongations.
- F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Cooperate with testing agency to facilitate the execution of its duties.
 - 1. Before concrete placement, testing agency will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
 - a. Location and number of tendons.
 - b. Tendon profiles and cover.
 - c. Installation of backup bars, hairpins, and other nonprestressed reinforcement shown on post-tensioning installation drawings.
 - d. Installation of pocket formers and anchorage devices.
 - e. Repair of damaged sheathing.
 - f. Connections between sheathing and anchorage devices.

2. Testing agency will record tendon elongations during stressing.
3. Testing agency will immediately report deviations from the Contract Documents to Architect.

3.9 PROTECTION

- A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade component.
- B. Protect exposed components within one workday of their exposure during installation.
- C. Prevent water from entering tendons during installation and stressing.
- D. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.10 REPAIRS

- A. Submit repair procedure to Architect for evaluation and approval.
- B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Architect.

END OF SECTION

DIVISION 04
MASONRY

SECTION 04 20 00 – UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Face brick veneer.
 - 3. Mortar and grout.
 - 4. Steel reinforcing bars.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Miscellaneous masonry accessories.
 - 9. Cavity-wall insulation.
- B. Related Sections:
 - 1. Section "05 series "Structural Steel" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
 - 2. Section 05500 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
 - 3. Section 07620 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
 - 4. Re: Section 06160 "Sheathing" for Insulation Board Type.
 - 5. See fluid applied membrane "section 072726" for applications on cmu.
 - 6. Thermal Insulation specification – see exterior insulation board and loose perlite for cmu cells.
 - 7. SEE FIRE EXTINGUISHER SPECIFICATIONS FOR RECESSES IN CMU WALLS.
 - 8. SEE TOILET ACCESSORY SPECIFICATIONS FOR RECESSES IN CMU WALL FOR WASTE RECEPTACLES.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in concrete filled cells.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
 4. Masonry Accessories.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on drawings of a typical exterior wall with a window. The mockup window may be smaller than that of a standard window, but it must include the steel lintel, flashing, caulking, and all waterproofing of the typical wall assembly. The mockup shall be no less than 6' wide and 9' tall. The interior cmu assembly must be included with reinforcing and brick ties. Typical parapet assembly must also be installed. Include brick weeps and mortar net on the mockup. The mockup shall be installed on a concrete pad (minimum 12" thick). The mockup must be created no later than two months from notice to proceed. The purpose of the mockup is to approve exterior building colors, storefront & glazing, waterproofing methods, and flashing. The return rowlock at door openings shall also be discussed and mocked up at an exterior door for approval.
 - a. Include a sealant-filled joint at least 16 inches long in each mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, building wrap sheathing joint-and-penetration treatment air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 2. Clean exposed faces of mockups with masonry cleaner as indicated
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

- a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 - F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 "Project Management and Coordination."
 - G. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
 - 1. **Masonry Units**
 - a. Include material test reports, substantiating compliance with requirements
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units
 - 2. **Cementitious materials.** Include brand, type, and name of manufacturer.
 - 3. **Preblended, dry mortar mixes.** Include description of type and proportions of ingredients.
 - 4. **Grout mixes.** Include description of type and proportions of ingredients.
 - 5. **Reinforcing bars.**
 - 6. **Joint reinforcement.**
 - 7. **Anchors, ties, and metal accessories**
 - H. **Mix Designs:** For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
 - 2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
 - I. **Statement of Compressive Strength of Masonry:** For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in TMS 602.
 - J. **Cold-Weather Procedures:** Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 - B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
 - C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil. Preinstallation Conference:
- F. Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- G. Installer: Minimum 5 years experience in similar types of work and able to furnish a list of previous jobs and references if requested by Owner's Representative.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

Increase extent of cover in first subparagraph below as needed to suit local climatic conditions.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. CMU units must have a reasonably uniform grain. Reject all block with rough and uneven grain. CMU from new factory forms is recommended. **Continuous defects in block, especially from old factory forms will be rejected.**

- C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners unless otherwise indicated. Do not bullnose the cmu course to receive a ceiling grid and floor base, in order for the ceiling grid/base to have a square edge matching up with a square block.
 3. Fill cells of cmu where anchors will be required for solid surface countertop brackets, tv mounts, ada grab bars, etc.
 - 4.
- B. CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **2000 psi**.
 2. Density Classification: Lightweight.
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Size (Width): Manufactured to the following dimensions:
 - a. 16" x 8" x 8" nominal; 15-5/8" x 7-5/8" x 7-5/8" actual.
 - b. 16" x 12" x 8" nominal; 15-5/8" x 11-5/8" x 7-5/8" actual.
 - c. 16" x 4" x 8" mm nominal; 15-5/8" x 3-5/8" x 7-5/8" actual.
 - d. Matching U-Blocks of 8" & 16" ht x 8" & 16" length x matching width.
 5. Exposed Faces: Provide uniform texture, provide pre-rounded shaped on interior block at outside corners, typical.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished. (no holes to be exposed)
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
 5. Return rowlock course at openings (mitered corner)
- B. Face Brick:
1. Products: Subject to compliance with requirements, provide one of the following:

- a. Size, Texture, and color as selected by Architect to best match existing veneer brick on existing buildings on campus
- b. Size and Shape: Nominal modular size
- c. Special shapes as require: use solid units where cores (frogs) would otherwise be exposed to view.
- d. Manufacturer:
 - 1) General Shale
 - a) Color #1: Chestnut Velour (basis of Design)
 - b) Color #2: Cascade White Velour (basis of Design)
 - 2) Meridian, subject to approval by the Architect
 - 3) Acme, subject to approval by the Architect

2.4 MORTAR AND GROUT MATERIALS

A. Masonry Mortar Mix: ASTM C 91.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Holcim (US) Inc.; Mortamix Masonry Cement.
 - b. Lafarge North America Inc.; Magnolia Masonry Cement Lafarge Masonry Cement.
 - c. Lehigh Cement Company; Lehigh Masonry Cement.
2. Strength Type: N
3. Color:
 - a. Standard gray CMU. Submit mortar samples for approval at brick.

B. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

C. Water: Potable.

D. The mortar color must remain true and consistent in color throughout the entire project. Any inconsistencies in mortar color will be rejected and removed. All brick mortar must come from the same factory run to ensure consistency in color.

2.5 REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.

SECTION 04 90 00 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes, but is not limited to:
 - 1. Cleaning new brick, concrete masonry, and stone.
- C. Related Sections:
 - 1. Section 07 19 00 - Water Repellents
 - 2. Section 07 90 00 - Caulking & Sealants

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D 3960 - Standard Practice for Determining Volatile Organic Compound Content of Paints and Related Coatings; 1996.
 - 2. D 5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water-Repellent Treatments; 1991 (Reapproved 1997).

1.3 SUBMITTALS

- A. Shop drawings, product data, and samples under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's printed literature for each product, including test data indicating compliance with requirements, and installation instructions.
 - 1. Cleaning Plan: Written description of cleaning process, including materials, methods, equipment, and sequencing of work.
- C. Applicator Qualifications: Submit qualifications of applicator.
 - 1. Certification stating applicator is experienced in the application of the specified products from the manufacturer.
 - 2. List of recently completed masonry cleaning projects, including project name and location, names of owner and architect, description of cleaning products used and substrates, applicable local environmental regulations, and application procedures.
- D. Environmental Regulations: Submit description for testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Submit applicable local environmental regulations.
- E. Protection: Submit description for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with masonry cleaners, residues, rinse water, fumes, wastes, and cleaning effluents.
- F. Surface Preparation: Submit description for surface preparation of substrates to be

completed before application of masonry cleaners.

- G. Application: Submit description for application procedures of masonry cleaners.

1.4 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer Qualifications:
 - a. Manufacturer capable of providing field service representation during installation and who will approve the installer and application method.
 2. Installer Qualifications:
 - a. Installer experienced in performing this type of work and who has specialized in work similar to the type required for this project.
- B. Test Panels:
1. Before full-scale application, test products to be used on test panels.
 2. Review manufacturer's product data sheets to determine suitability of each product for each surface.
 3. Apply products using manufacturer-approved application methods, determining actual requirements for application.
 4. After 48 hours, review effectiveness of cleaning or treatment, compatibility with substrates, and ability to achieve desired results.
 5. Obtain approval by Architect and Owner of workmanship, color, and texture before proceeding with work.
 6. Test Panels: Inconspicuous sections of actual construction.
 - a. Location and number as selected by Architect.
 - b. Size; 4 feet by 4 feet.
 - c. Repair unacceptable work to the satisfaction of the Architect and Owner.
 7. Regulatory Compliance
 - a. Comply with applicable federal, state, and local environmental regulations including testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents.
- C. Pre-installation Meetings
1. Comply with provisions of Section 01 31 00 - Project Management and Coordination.
 - a. Applicator and Product representative shall be present during meeting.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 62 00 - Storage and Protection

1.6 PROJECT CONDITIONS

- A. Project Environmental Requirements
1. Do not apply products under conditions outside manufacturer's requirements, which include:
 - a. Surfaces that are frozen; allow complete thawing prior to installation.
 - b. Surface and air temperatures below 40 degrees F.

- c. Surface and air temperatures above 95 degrees F.
- d. When surface or air temperature is not expected to remain above 40 degrees F for at least 8 hours after application.
- e. Wind conditions that may blow materials onto surfaces not intended to be treated.
- f. Less than 24 hours after a rain or 6 hours before rain is expected after installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
 - 1. PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS; (800) 255-4255; www.prosoco.com
 - 2. Shore Corporation, 2917 Spruce Way Pittsburgh PA; (800).860.4978; www.shorebest.com
 - 3. Environmental Manufacturing Solutions, 7705 Progress Circle Melbourne, Florida; (800) 510-8812; www.enviromfg.com
 - 4. Substitutions: Under provisions of Section 01330 - Submittals and Substitutions.

2.2 MATERIALS

- A. Water: Clean, potable, and free of oils, acids, alkalis, salts, and organic matter. Use to rinse masonry surfaces and dilute concentrated cleaners.

2.3 MASONRY CLEANERS

- A. Water for Cleaning: Potable.
- B. Cleaning Agents
 - 1. PROSOCO Enviro Klean 2010 All Surface Cleaner.
 - 2. DIEDRICH 960 HEAVY DUTY CONCRETE CLEANER
 - 3. Enviro-safe NuLook Concrete Cleaner

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Verify that substrates are acceptable for product installation; do not begin until substrates meet manufacturer's requirements.
 - 2. Do not begin until test panels have been approved by Architect.

3.2 PREPARATION

- A. Comply with provisions provided by products manufacturer.
- B. Surface Preparation
 - 1. Protect surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with masonry cleaners, residues, rinse water, fumes, wastes, and cleaning effluents in accordance with manufacturer's written instructions.
 - 2. On surfaces to be coated or treated, remove dirt, dust, oil, grease, and other contaminants that would interfere with penetration or performance of products; where cleaners are required, use products recommended by manufacturer; rinse thoroughly and allow to dry completely.
 - 3. Apply all specified sealants and caulking and allow curing before cleaning process begins.
 - 4. Divert and protect pedestrian and auto traffic.
 - 5. Avoid wind drifting of spray of cleaning products, residues, and rinse water.
 - 6. Protect open joints.
 - 7. Clean interior masonry surfaces before installation of interior finishes, doors, hardware, metal fixtures, and all other interior non-masonry materials.

3.3 APPLICATION

- A. Comply with provisions of Section 01 70 00 - Execution Requirements.
- B. Clean all exposed surfaces of new masonry of excess mortar, efflorescence, stains, and job dirt, using materials specified.
- C. Clean from bottom up; prevent cleaning materials and rinse water from contacting non-cementitious materials.
- D. Clean in accordance with manufacturer's instructions and recommendations, product data, and container label instructions.
- E. Mix materials in strict accordance with manufacturer's instructions; do not dilute unless permitted by manufacturer.
- F. Prevent overspray, wind drift, and splash onto surfaces not to be treated.
- G. No high pressure washers are allowed.
- H. Low pressure spray for wetting and rinsing is permitted. Pressure should be in the range of 400-1000 psi. Equipment should produce 6-8 gallons of water per minute using a 15-40 degree fan tip (no fan tip less than a 15 degree is allowed).
- I. The use of bleach is strictly disallowed.

3.4 FIELD QUALITY CONTROL

- A. Comply with provisions of Section 01 40 00 - Quality Requirements.
- B. Inspection:
 - 1. Inspect the masonry cleaning work with the Contractor, Architect, applicator, and product representative, and compare with test panel results approved by the Architect. Determine if the substrates are suitably clean.

C. Manufacturers' Field Services

1. Provide the services of the manufacturer's authorized field representative to verify that installed products comply with manufacturer's requirements and with the standard established by the Architect-approved test panels. (Contractor Note: Manufacturer's Representative to provide written approval to Architect that surface is clean and acceptable for installation of specified waterproofing product.)

3.5 CLEANING

- A. At completion of work, remove protective coverings.
- B. Protect completed work from damage during construction.
- C. Clean site of all unused cleaning products, residues, rinse water, wastes, and cleaning effluents in accordance with environmental regulations
- D. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-masonry surfaces damaged by exposure to the cleaning process.

END OF SECTION 04 90 00

3. Wire Size for Side Rods: 9 ga.
 4. Wire Size for Cross Rods: 9 gauge
 5. Wire Size for Veneer Ties: 3/16" dia. hot dipped galvanized triangle Wire Tie.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- B. Masonry Joint Reinforcement for Single-Wythe Masonry: Truss type with single pair of side rods.
1. H & B #220 Ladder Mesh reinforcement @ 16" o.c. vertically, hot dipped galvanized 9 ga.
 2. Wire Bond 200 series Ladder Mesh reinforcement @ 16" o.c. vertically, hot dipped galvanized 9 ga.
- C. Masonry Joint Reinforcement for Multiwythe Masonry:
1. H & B # 265 Ladder Adjustable Reinforcement Wire @ 16" o.c. vertically with 3/16" adjustment hooks @ 16" o.c. x 3/16" dia. All hot dipped galvanized. Use seismic wire tie at stack bond veneer only
 2. Wire Bond 800 series Ladder Adjustable Reinforcement Wire @ 16" o.c. vertically with 3/16" adjustment hooks @ 16" o.c. x 3/16" dia. All hot dipped galvanized. . Use seismic wire tie at stack bond veneer only

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
- B. Brick Veneer Ties for Steel and Wood Studs, 1/2 sheathing & 1" insulation board: (if required)
1. Heckman – Posi-I-Tie with 3/16" dia. hot dipped triangular wire tie. Use seismic wire tie and horizontal rod at stack bond veneer only.
 2. H & B 2-Seal tie with 3/16" dia. hot dipped triangular wire tie. Use seismic wire tie and horizontal rod at stack bond veneer only
- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, spacing 16" o.c..
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
- E. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

2.7 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mils.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 2) Hohmann & Barnard, Inc.; Textroflash.
 - 3) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - 4) Polyguard Products, Inc.; Polyguard Aluma-Flash.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer. Tape top edge.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth **1/8 inch** less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Mortar Maze weep vent.
 - 2) Blok-Lok Limited; Cell-Vent.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
 - 4) Heckmann Building Products Inc.; No. 85 Cell Vent.

5) Hohmann & Barnard, Inc.; Quadro-Vent.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.; Mortar Break.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - d. Mortar Net USA, Ltd.; Mortar Net.
2. Provide one of the following configurations:
 - a. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.9 CAVITY-WALL INSULATION

- A. Foil-Faced, Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type I or Type II, Class 2, rigid, cellular, polyisocyanurate thermal insulation. Foil-Faced Polyiso Insulation board over all exterior wall sheathing @ conditioned spaces and over cmu @ conditioned spaces. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.
- B. See section 06 16 00 Sheathing, for insulation types

2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [Diedrich Technologies, Inc.](#)
- b. [EaCo Chem, Inc.](#)
- c. [ProSoCo, Inc.](#)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus **1/2 inch** or minus **1/4 inch**.
2. For location of elements in plan do not vary from that indicated by more than plus or minus **1/2 inch**.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus **1/4 inch** in a story height or **1/2 inch** total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than **1/4 inch in 10 feet**, or **1/2 inch** maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet**, **1/4 inch in 20 feet**, or **1/2 inch** maximum.
3. For vertical lines and surfaces do not vary from plumb by more than **1/4 inch in 10 feet**, **3/8 inch in 20 feet**, or **1/2 inch** maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet**, **1/4 inch in 20 feet**, or **1/2 inch** maximum.
5. For lines and surfaces do not vary from straight by more than **1/4 inch in 10 feet**, **3/8 inch in 20 feet**, or **1/2 inch** maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 feet**, or **1/2 inch** maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch** except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**, with a maximum thickness limited to **1/2 inch**.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than **1/8 inch**.
3. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch** or minus **1/4 inch**.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than **1/16 inch** from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal **4-inch** horizontal face dimensions at corners or jambs.

- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than **4-inches**. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal **4-inch** horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide **1/2-inch** clearance between end of anchor rod and end of tube. Space anchors **48 inches** o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07842 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer **3/4 inch** or more in width.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use tab-type reinforcement.
 3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
 4. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.
- E. Coat cavity face of backup wythe to comply with Section 07115 "Bituminous Dampproofing."
- F. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Attach insulation board at metal studs with special stud anchors. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
1. Space reinforcement not more than 16 inches o.c.
 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than **1 inch** wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than **24 inches** o.c. vertically and **36 inches** o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors through sheathing and insulation board to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
 - 3. Embed tie sections in masonry joints. Provide not less than **1.5 inches** of air space between back of masonry veneer and face of sheathing.
 - 4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 5. Space anchors as indicated, but not more than **16 inches** o.c. vertically and **16 inches** o.c. horizontally, with not less than 1 anchor for each **2 sq. ft.** of wall area. Install additional anchors within **12 inches** of openings and at intervals, not exceeding **8 inches**, around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.
 - 2. Spacing of joints shall not exceed 26' o.c. Provide joint plan for review by architect.
- C. Form expansion joints in brick as follows:
 - 1. Form open joint full depth of brick wythe and of width indicated, but not less than **1/2 inch** for installation of sealant and backer rod specified in Section 07920 "Joint Sealants."

2. Provide vertical joints not more than 7' from outside corners and not more than 40' o.c. at solid walls.
 3. Provide Vertical joints at head and sill/jamb of windows.
- D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07920 "Joint Sealants," but not less than **3/8 inch**.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of **8 inches** at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of **8 inches**, and **1-1/2 inches** into the inner wythe.
 3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of stud sheathing at least **8 inches**; with upper edge tucked under building paper or building wrap, lapping at least **4 inches**. Screw flashing at each stud at top edge. Tape upper edge covering screws and edge..
 4. At lintels and shelf angles, extend flashing a minimum of **6 inches** into masonry at each end. At heads and sills, extend flashing **6 inches** at ends and turn up not less than **2 inches** to form end dams. Extend flashing under aluminum sill and a min.8" above opening head. Attach to wall sheathing as described in paragraph 3 above.
- B. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing at head and sill of windows, and at top of brick veneer walls.
 1. Use specified weep/vent products to form weep holes.
 2. Space weep holes **24 inches** o.c. unless otherwise indicated.
- C. Place mortar mesh continuously at base of wall and head of openings.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Provide the following masonry min. wall reinforcing and/or as shown on drawings:
 1. #4 embedded into slab continuous up to and hook, (3") into u-block.
 - a. At each side of wall opening.

- b. At each outside corner.
 - c. On each side of an expansion joint or control joint.
 - d. Bottom rod shall be 32" ht. and epoxy bedded 4" into cured slab. Submit product submittal
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place pea gravel concrete until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Testing Prior to Construction: One set of tests.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent

construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows: clean masonry to meet Tyvek's approval for receiving fluid applied membrane on exterior facing cmu block.
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 8. Clean stone trim to comply with stone supplier's written instructions.
 - 9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than **4 inches** in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 02300 "Earthwork."
 - 3. Do not dispose of masonry waste as fill within **18 inches** of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

DIVISION 05
METALS

SECTION 05 12 00 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Architecturally exposed structural steel.
 - 3. Grout.
- B. Related Sections include the following:
 - 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section "Steel Deck" for field installation of shear connectors.
 - 3. Division 5 Section "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel.
 - 4. Division 9 painting Sections for surface preparation and priming requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.
- B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," 13th Edition.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.
- B. Construction: Type PR, partially restrained.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For Installer, fabricator, and testing agency.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Tension-control, high-strength bolt-nut-washer assemblies.
 - 5. Shear stud connectors.
- F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC's "Specification for the Allowable Stress Design for Structural Steel Buildings."
 - 3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 4. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
 - 5. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain at interior locations; hot-dip zinc coating (ASTM A 153/A 153M, Class C) or mechanically deposited zinc coating (ASTM B 695, Class 50) at exterior locations.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type.
 - a. Finish: Plain at interior locations; mechanically deposited zinc coating (ASTM B 695, Class 50) or mechanically deposited zinc coating (ASTM B 695, Class 50) at exterior locations.

- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Hooked.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - 5. Finish: Plain.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - 4. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Washers: ASTM A 36/A 36M carbon steel.
 - 3. Finish: Plain.
- F. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- G. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- H. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Allowable Stress Design for Structural Steel Buildings, 13th Edition."
 - 1. Camber structural-steel members where indicated.

2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 3. Mark and match-mark materials for field assembly.
 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale and roughness.
 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- G. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces.
 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. At architecturally exposed steel, remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

- a. Grind butt welds flush.
- b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials.
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
 1. Fill vent holes and grind smooth after galvanizing.
 2. Galvanize lintels located in exterior walls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Allowable Stress Design Specification for Structural Steel Buildings, 13th Edition."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. At architecturally exposed steel, remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections:
 - 1. Field welds will be visually inspected according to AWS D1.1.
 - 2. In addition to visual inspection, all full-penetration groove welds shall be subjected to ultrasonic testing in accordance with AWS D1.1, Section 6, Part C, Ultrasonic Testing of Groove Weld.
 - 3. All welds that fail ultrasonic testing shall be re-welded and re-tested until they pass the test.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional 10% of shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION 05 12 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Roof deck.

- B. Related Sections include the following:

- 1. Division 3 Section "Cast-in-Place Concrete" for concrete fill.
 - 2. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
 - 3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: For each type of steel deck, signed by product manufacturer.
- D. Welding certificates.
- E. Field quality-control test and inspection reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- D. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.6 COORDINATION

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Deck:
 - a. ASC Profiles, Inc.
 - b. Canam Steel Corp.;The Canam Manac Group.
 - c. Consolidated Systems, Inc.
 - d. DACS, Inc.
 - e. D-Mac Industries Inc.
 - f. Epic Metals Corporation.
 - g. Marlyn Steel Decks, Inc.
 - h. New Millennium Building Systems, LLC.
 - i. Nucor Corp.; Vulcraft Division.
 - j. Roof Deck, Inc.
 - k. United Steel Deck, Inc.
 - l. Valley Joist; Division of EBSCO Industries, Inc.
 - m. Verco Manufacturing Co.
 - n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
 - 1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
 - a. Color: Manufacturer's standard.
3. Deck Profile: As indicated.
4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.
- J. Galvanizing Repair Paint: ASTM A 780.
- K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: as indicated.
 - 3. Weld Washers: Install weld washers at each weld location if uncoated steel thickness is less than 0.028 inch (0.71 mm)..
 - 4. Side-Lap and Perimeter Edge Fastening: As indicated.
- B. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum.
- C. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Contracting Officer will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Design/Built Contractor and Design/Built Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Design/Built Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior load-bearing wall framing.
 - 2. Interior load-bearing wall framing.
 - 3. Interior non-load-bearing wall framing.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.

1.3 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Welding certificates.
- D. Qualification Data: For professional engineer.
- E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- F. Research/Evaluation Reports: For cold-formed metal framing.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work shall be a member of the Steel Stud Manufacturers Association.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: ST33H (ST230H) for 16 gauge and heavier, ST50H (ST340H) for 18 gauge and lighter.
 - 2. Coating: G60 (Z180).

- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

- 1. Grade: Match stud grade.
- 2. Coating: G90 (Z275).

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard punched C-shaped steel studs, of depth, thickness, width and spacing as indicated.
- B. Steel Track: Manufacturer's standard unpunched U-shaped steel track, of thickness, depth, and width as indicated.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of thickness, depth, and width as indicated.

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard punched C-shaped steel studs, of thickness, depth, width and spacing as indicated
- B. Steel Track: Manufacturer's standard unpunched U-shaped steel track, of thickness, depth, and width as indicated.
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers, knee braces, and girts.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C or by mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members as indicated. If no connection type is indicated provide connection by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

- a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
- K. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs, unless noted otherwise on structural drawings. Align tracks accurately and securely anchor at corners and ends and at spacings as indicated.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in wall studs, spaced not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches (450 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 2. Bridging: Provide one of the following:
 - a. Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

- b. Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - c. Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches (450 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 2. Bridging: Provide one of the following:
 - a. Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - b. Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - c. Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.

- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

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

END OF SECTION 05 40 00

SECTION 05 44 00 - PRE-ENGINEERED, PRE-FABRICATED COLD-FORMED STEEL ROOF TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pre-engineered, pre-fabricated cold-formed steel framing elements. Work includes:

1. Cold-Formed steel roof trusses.
2. Anchorage, bracing and bridging.

B. Related Sections

1. Section 05 30 00 – Metal Decking
2. Section 05 40 00 – Cold-Formed Steel Framing

1.2 REFERENCES

A. Reference standards:

1. ASTM:
 - a. ASTM A1003/A1003M “*Standard Specification for Steel Sheet, Carbon, Metallic and nonmetallic-Coated for Cold-Formed Framing Members*”
 - b. ASTM A780-93a “Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.”
2. American Welding Society (AWS)
 - a. AWS D1.1 “Structural Welding Code - Steel.”
 - b. AWS D1.3 “Structural Welding Code - Sheet Steel.”
3. Structural Building Components Association - Cold-Formed Steel Building Component Safety Information (CFSBCSI)
4. American Iron and Steel Institute, North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 – AISI S100-2012
5. American Iron and Steel Institute Standard for Cold-Formed Steel Framing-AISI S240-15

1.3 PERFORMANCE REQUIREMENTS

A. AISI “Specifications”: Calculate structural characteristics of cold-formed steel truss members according to American Iron and Steel Institute “North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 – AISI S100-2012

B. Structural Performance: Design, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.

1. Design Loads: As specified.
2. Deflections: Live load deflection meeting the following (unless otherwise specified):
 - a. Roof Trusses: Vertical deflection less than or equal to Length/240.

1.4 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of cold-formed steel framing and accessory required.
- B. Submit detailed roof truss layouts indicating placement of trusses.
- C. Submit individual truss drawings, sealed and signed by a qualified registered Professional Engineer, verifying accordance with local building code and design requirements. Include:
 - 1. Description of design criteria.
 - 2. Engineering analysis depicting member stresses and truss deflection.
 - 3. Truss member type, sizes and thickness and connections at truss joints.
 - 4. Truss support reactions.
 - 5. Top chord, Bottom chord and Web bracing requirements.
- D. Submit "The Works" (by MiTek®) final roof plan drawings sealed and signed by a qualified registered Professional Engineer depicting final installed truss assembly. Include:
 - 1. All truss to truss connections
 - 2. All truss to structure (bearing) connections
 - 3. Plan and details for the location of all permanent lateral and diagonal bracing and/or blocking required in the top chord, web, and bottom chord planes. (Diaphragms excluded)

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Fabrication shall be performed in a quality controlled manufacturing environment by a cold-formed steel truss fabricator with experience fabricating cold-formed steel trusses equal in material, design, and scope to the trusses required for this Project.
 - 1. Installation of cold-formed steel truss roof assembly shall be performed by an installer with experience installing cold-formed steel trusses equal in material, design and scope to the trusses required for this Project.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by 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.
- C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.7 PROJECT CONDITIONS

- A. During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one truss.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Ultra-Span® Truss Manufacturer. Contact MiTek® at 1-866-902-3447, or visit www.mii.com. A list of fabricators that supply this state are:

Steelway International	903-292-1738

Cushing Truss	918-387-2080

2.2 COMPONENTS

- A. System components: ULTRA-SPAN® cold-formed steel roof truss truss components.
- B. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete cold-formed steel truss roof assembly.

2.3 MATERIALS

- A. Materials:

1. For all chord and web members: Fabricate components of structural quality steel sheet per ASTM A1003 with a minimum yield strength of 50,000 psi.
2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A1003 with a minimum yield strength of 33,000 psi.

- B. Ultra-Span steel truss components: Provide sizes, shapes and material thickness indicated.

1. Design Uncoated-Steel Thickness: 0.0350 inch (0.89 mm)
2. Design Uncoated-Steel Thickness: 0.0460 inch (1.17 mm)
3. Design Uncoated-Steel Thickness: 0.0570 inch (1.45 mm)
2. Design Uncoated-Steel Thickness: 0.0730 inch (1.85 mm)
3. Design Uncoated-Steel Thickness: 0.0970 inch (2.46 mm)

- C. Finish: Provide components with protective zinc coating complying with ASTM A1003, minimum G60 coating.

- D. Fastenings:

1. Manufacturer recommended self-drilling screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8" thick.
3. Other fasteners as accepted by truss engineer.

2.4 FABRICATION

- A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
1. Fabricate truss assemblies in jig templates.
 2. Cut truss members by sawing or shearing or plasma cutting.
 3. Fasten cold-formed steel truss members by screw fastening, or other methods as standard with fabricator.
 - a. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- B. Care shall be taken during handling, delivery and erection. Brace, block, or reinforce the truss as necessary to minimize member and connection stresses. Refer to SBCA - CFSBCSI.
- C. Fabrication Tolerances:
1. Overall Length: Fabricate each cold-formed steel truss to the maximum allowable tolerance as follows:
 - a. Truss length up to 30 ft – ½" tolerance
 - b. Truss length over 30 ft – ¾" tolerance
 2. Overall Height: Fabricate each cold-formed steel truss to the maximum allowable tolerance as follows:
 - a. Truss height up to 5 ft – ¼" tolerance
 - b. Truss height over 5 ft – ½" tolerance

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION, GENERAL

- A. General:
1. Erection of trusses, including proper handling, safety precautions, installation bracing and other safeguards or procedures is the responsibility of the Contractor and Contractor's installer. Refer to SBCA – CFSBCSI, or contact qualified registered Professional Engineer.
 2. Exercise care and provide installation bracing required to prevent collapse of trusses during erection and prior to installing permanent bracing system.
- B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.

- C. Provide proper lifting equipment, including spreader bar, suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.
- D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points.
- E. Install trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
 - 1. DO NOT cut truss members without prior approval of truss engineer.
 - 2. Fasten cold-formed steel trusses to supports by screw fastening, welding or other methods, as standard with fabricator.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-formed truss manufacturer's instructions with screw penetrating joined members by not less than three exposed screw threads.
 - 3. Install trusses in one-piece lengths, unless splice connections are indicated.
 - 4. Provide installation bracing and leave in place until trusses are permanently braced/restrained.

3.3 ROOF TRUSS INSTALLATION

- A. Install trusses per installation documents provided for in Section 1.4 (D)
- B. Space trusses per sealed truss drawings.
- C. Do not alter, cut, or remove truss members or connections of truss members.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.
- E. Erection Tolerances:
 - 1. Limit overall bow or bow in any chord member to the lesser of $L/200$ or 2 inches. L equal to length of truss or member.
 - 2. Limit out-of-plane plumb to the lesser of $L/50$ or 2 inches. L equal to the height of the truss.
 - 3. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- F. Erect trusses without damaging truss members or connections.
- G. Anchor trusses securely at all points of support, per installation documents provided for in Section 1.4 (D)
- H. Install all continuous bridging and permanent truss bracing per installation documents provided for in Section 1.4 (D).
- I. Perform all truss to truss connections per installation documents provided for in Section 1.4 (D).

3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A780 and the manufacturer's instructions.

END OF SECTION 05 44 00

SECTION 05 21 00 – STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. Joist accessories.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Division 4 Section "Unit Masonry Assemblies" for installing bearing plates in unit masonry.

1.3 DEFINITIONS

- A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support non-uniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
- B. Design special joists to withstand design loads with total load deflections no greater than the following:
 - 1. Floor Joists: Vertical deflection of 1/360 of the span.
 - 2. Roof Joists: Vertical deflection of 1/360 of the span.

1.5 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- C. Welding certificates.
- D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.
- E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.
- F. Qualification Data: For manufacturer.
- G. Field quality-control test and inspection reports.
- H. Research/Evaluation Reports: For joists.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
- B. Steel Bearing Plates: ASTM A 36/A 36M.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Welding Electrodes: Comply with AWS standards.
- F. Galvanizing Repair Paint: ASTM A 780.

2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

- D. Provide holes in chord members for connecting and securing other construction to joists.
- E. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- F. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- G. Do not camber joists.
- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber long-span steel joists according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.5 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joist girders.
- D. Camber joist girders according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.6 JOIST ACCESSORIES

- A. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. [Shop prime paint] [Hot-dip zinc coat according to ASTM A 123/A 123M].
- C. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."
- D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.7 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Field welds will be visually inspected according to AWS D1.1/D1.1M.
- C. Bolted connections will be visually inspected.
- D. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal ladders ladder to roof hatch
 - 2. Metal bollards.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 04 20 00 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 3. Section 05 12 00 "Structural Steel Framing."
 - 4. Section 12 93 00 "Site Furnishings" for bicycle racks.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Metal ladders.
 - 2. Metal bollards.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.
- B. Structural Performance of Ladders: Ladders shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 150 lbf/sq. ft..
 - 2. Concentrated Load: 350 lbf applied on an area of 4 sq. in..
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Ladders of withstanding stresses resulting from railing loads in addition to loads specified above.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Pipe: ASTM A 53/A 53M, Solid rungs 3/4" dia.
- D. Angle Framing: Hot Rolled angles
 - 1. Size of Channels: 2" x 2" x 3/8".

The entire ladder(s) assembly shall be primed and painted with an oil based paint.

Paint color shall be "gloss black".

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
 - 4. Provide bronze fasteners for fastening bronze.

- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: [Torque-controlled expansion anchors] [or] [chemical anchors].
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- H. \

2.4 MISCELLANEOUS MATERIALS

1.

- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe. Provide rounded steel top cap for bollards. Bollards shall be primed and painted with an oil based paint. Paint color chosen in field by architect.
 2. Anchor bollards 16" into concrete with 8" of concrete all around with 5 - #4 vertical rebars and #3 spiral cage 4" o.c.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch-diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
 - a. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1) [Harsco Industrial IKG, a division of Harsco Corporation.](#)
 - 2) [SlipNOT Metal Safety Flooring; W.S. Molnar Company.](#)
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
8. Galvanize and prime exterior ladders, including brackets.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Cap bollards with rounded steel caps welded to bollard..
2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

- B. Anchor Bollards 16" deep in concrete, min. 8" thick all around bollard with 5-#4 vertical rebars and #3 horizontal ties at 4" o.c..
- C. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch wall-thickness steel tubing with an OD approximately 1/16 inch less than ID of bollards. Match drill sleeve and bollard for 3/4-inch steel machine bolt.
- D. Prime bollards with zinc-rich primer.

2.9 METAL DOWNSPOUT BOOTS

- A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
 - 1. Outlet: Offset Vertical, to discharge into pipe. 6x6 inch top and 6" dia. bottom.
- B. Prime cast-iron downspout boots with zinc-rich primer and paint with color chosen by architect.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with [zinc-rich primer.] [primer specified in Section 09 96 00 "High-Performance Coatings."]

2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 1. Do not fill removable bollards with concrete.
- A. Anchor Bollards 16" deep in concrete, min. 8" thick all around bollard with 5-#4 vertical rebars and #3 horizontal ties at 4" o.c..
- B. Anchor internal sleeves for removable bollards in [concrete by inserting in pipe sleeves preset into concrete] [formed or core-drilled holes not less than **8 inches** deep and **3/4 inch** larger than OD of sleeve]. Fill annular space around internal sleeves solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward internal sleeve.
- C. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13 "Exterior Painting." Section 09 91 23 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 05 54 00 - DOWNSPOUT BOOTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Cast Iron Downspout Boots. (powder coated and finished)
- B. Related Sections include the following:
 - 1. Division 7 Section "Sheet Metal Flashing and Trim" for gutter and downspout components.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Clips and anchorage devices.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. PROJECT CONDITIONS
- C. Field Measurements: Verify actual locations of walls and other construction contiguous with downspout boots by field measurements before submittal of Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.4 COORDINATION

- A. Coordinate installation of downspout boots with downspouts. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

2. Cast Iron Downspout Boots:

- a. Barry Pattern & Foundry Company, Inc.
- b. Smith 1700 series
- c. Mifab R1500 series
- d. J.R. Hoe

2.2 DOWNSPOUT BOOTS

- A. Size and Design: Barry Pattern & Foundry Company is used here as a “Basis of Design”

1. Size: Diameter – to fit over new metal fabricated downspouts, Length - 30”
2. Basis of Design: Smith 1700 series. Boots shall be powder coated and color options presented to architect for selection.
3. Downspout boots shall tie into existing underground piping. The boot diameter shall fit into the existing drain hub currently located at each downspout.

2.3 STEEL FINISHES

- A. Boots shall be powder coated, and color options presented to architect for selection.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing downspout boots to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after installation, clean bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 05 54 00

**DIVISION 06 – WOOD, PLASTICS
AND COMPOSITES**

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Rooftop equipment bases and support curbs
 - 2. Wood blocking cants, nailers, curbs, stripping, furring and similar members.
 - 3. Wood members for marine applications.
 - 4. Wood, nails, bolts, screws, framing anchors and other rough hardware, and other items needed, and perform rough carpentry for the construction shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Codes and standards:
 - 1. In addition to complying the pertinent codes and regulations of governmental agencies having jurisdiction, unless otherwise specifically directed or permitted by the Architect comply with:
 - a. "Product Use Manual" of the Western Wood Products Association for selection and use of products included in that manual;
 - b. "Plywood Specification and Grade Guide" of the American Plywood Association;
 - c. "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Bureau for Redwood, when used.

1.3 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01 62 00 - Storage and Protection.
- B. Protection:
 - 1. Deliver the materials to the job site and store, in a safe area, out of the way of traffic, and shored up off the ground surface.
 - 2. Identify framing lumber as to grades, and store each grade separately from other grades.
 - 3. Protect metals with adequate waterproof outer wrapping.
 - 4. Use extreme care in off loading of lumber to prevent damage, splitting, and breaking of materials.

PART 2 - PRODUCTS

2.1 GRADE STAMPS

- A. Identify framing lumber by the grade stamp of the West Coast Lumber Inspection Bureau, Southern Pine Association or Such other grade stamp as is approved in advance by the Architect.
- B. Identify plywood as to species, grade, and glue type by the stamp of the American Plywood Association.
- C. Identify other materials of this Section by the appropriate stamp of the agency approved in advance by the Architect.

2.2 MATERIALS

- A. Provide materials in the quantities needed for the Work shown on the Drawings, and meeting or exceeding the following standards of quality:
 - 1. All lumber resting on masonry or concrete or galvanized framing to be #2 wolmanizedpine. Separate treated wood from all galvanized metals with asphalt impregnated building paper, 30# min.
 - 2. Horizontal framing members: Douglas Fir-Hemlock, Table 1, Construction grade, 1,500 PSI, #2 KD Pine.
 - 3. Vertical framing members: Douglas Fir-Hemlock, Table 1, Standard grade, 1,550 PSI, #2 KD Pine.
 - 4. Plywood:
 - a. Sheathing: Structural II, C-C, exterior; or standard sheathing with exterior glue.
 - 5. Building paper: Kraft paper complying with Fed Spec UU-B-790a.
 - 6. Wood preservative: Pressure treat board and dimension lumber with Waterborne Preservative according to AWWA-C2. Do not use chemicals containing arsenic or chromium after treatment, redry boards and dimension lumber to 19% maximum moisture content. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 - a. Wood cants, nailers, curbs, stripping and similar members in connection with roofing, flashing vapor barriers and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18 inches above grade.

7. Rough hardware:
 - a. Steel items:
 - (1) Comply with ASTM A7 or ASTM A36.
 - (2) Use stainless steel on any treated wood.
 - b. Machine bolts: Comply with ASTM A307. (Stainless Steel on treated wood.)
 - c. Lag bolts: Comply with Fed Spec FF-B-561. (Stainless Steel on treated wood.)
 - d. Nails:
 - (1) Use common except as otherwise noted.
 - (2) Comply with Fed Spec FF-N-1.
 - (3) Use stainless steel on treated wood.
 - e. Joist hangers: Simpson, Teco, or equal as approved by the Architect. (Separate hangers from treated wood with asphalt impregnated felts. 30# min.

NOTE: USE OF ANY TYPE OF PARTICLE BOARD IS PROHIBITED

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 DELIVERIES

- A. Stockpile materials sufficiently in advance of need to assure their availability in a timely manner for this Work.
- B. Make as many trips to the job site as are needed to deliver materials of this Section in a timely manner to ensure orderly progress of the Work.

3.3 COMPLIANCE

- A. Do not permit materials not complying with the provisions of this Section to be brought onto or to be stored at the job site.
- B. Promptly remove non-complying materials from the job site and replace with materials meeting the requirements of this Section.

3.4 WORKMANSHIP

- A. Produce joints which are tight, true, and well secured, with members assembled in accordance with the Drawings and with pertinent codes and regulations.
- B. Selection of Lumber pieces:
 - 1. Carefully select the members.
 - 2. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.
 - 3. Cut out and discard defects which render a piece unable to serve its intended function.
 - 4. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
- C. Do not shim any framing component.

3.5 GENERAL FRAMING

- A. General:
 - 1. In addition to framing operations normal to the fabrication and erection indicated on the Drawings, install wood blocking and backing required for the work of other trades.
 - 2. Set horizontal and sloped members with crown up.
 - 3. Do not notch, cut, or bore members for pipes, ducts, or conduits, or for other reasons except as shown on the Drawings or as specifically approved in advance by the Architect.
- B. Bearings:
 - 1. Make bearings full unless otherwise indicated on the Drawings.
 - 2. Finish bearing surfaces on which structural members are to rest so as to give sure and even support.
 - 3. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

3.6 BLOCKING AND BRIDGING

- A. Install blocking as required to support items of finish and to cut off concealed drafty openings, both vertical and horizontal, between ceiling and floor areas.

1. Provide maximum distance of 8'-0" between a line of bridging and a bearing.

3.7 ALIGNMENT

- A. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.

3.8 FASTENING

A. Screwing:

1. Use only stainless steel construction screws of type, size and length to secure all blocking. Provide Architect with sample of intended fasteners for review and approval.
2. Prebore as required.

B. Bolting:

1. Drill holes 1/16" larger in diameter than the bolts being used.
2. Drill straight and true from one side only.
3. Do not bear bolt threads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.
4. Use only stainless steel on treated wood. Separate treated wood with asphalt impregnated building paper, 30# min.

C. Screws:

1. For lag screws and wood screws, pre-bore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank.
2. Use only stainless steel on treated wood. Separate treated wood with asphalt impregnated building paper, 30# min.

END OF SECTION 06 10 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking and nailers.
 - 2. Wood furring and grounds.
 - 3. Plywood backing panels.
- B. Related Requirements:
 - 1. Cold Formed Metal Framing.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with

- requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
 2. Engineered wood products.
 3. Power-driven fasteners.
 4. Metal framing anchors.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

PART 3 - INSTALLATION

- A. **** Provide fifteen (15) 4'x8' sheets of 3/4" plywood to be mounted in various locations on cmu walls in mechanical and electrical rooms. The contractor shall include the labor to mount these sheets of plywood as instructed by the owner. These sheets will be installed on Unistrut – see Non-Structural Metal Framing specification.**

3.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency

certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness unless otherwise indicated.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

3.3 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2[for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground].
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Treat SYP with MCA process only.
- B. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- C. Application: Treat [all rough carpentry unless otherwise indicated.] [items indicated on Drawings, and the following:]
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

3.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
 - 7. Utility shelving.
 - 8. Provide blocking, inside metal stud framing, at corners that will receive corner guards.
 - 9. Provide blocking at all handrail & grab bar locations.
 - 10. Provide blocking as necessary for millwork/casework installations.
 - 11. Provide blocking as required for mounting marker & tack boards, electrical boxes, monitor mounts, etc.
- B. Dimension Lumber Items: No. 2 SYP grade lumber.
 - 1. **No. 3 Common]** grade; WCLIB or WWPA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

3.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness. Provide panels for Cox, AT&T, fire Alarm, Security systems, and as required for mounting equipment at all service rooms.

3.6 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

3.7 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. KC Metals Products, Inc.
 - 2. Simpson Strong-Tie Co., Inc.
 - 3. USP Structural Connectors.
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.

PART 4 - EXECUTION

4.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, toilet accessories, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

4.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

4.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally at 24 inches o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

4.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified], apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Wall sheathing.
2. Soffit sheathing.
3. Parapet sheathing.
4. Sheathing joint and penetration treatment.

- B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.
2. Section 07 25 00 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preserved-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2[for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground].
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: [Treat all plywood unless otherwise indicated] [Treat items indicated on Drawings] [and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing].

2.3 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia-Pacific Building Products.
 - b. National Gypsum Company.
 - c. United States Gypsum Company.
2. Type and Thickness: Type X, 5/8 inch thick.
3. Size: 48 by 96 inches, 48 by 108 inches 48 by 120, inches for vertical installation.

B. Cementitious Backer Units: ASTM C 1325, Type A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Gypsum Perma base
 - b. USG Durock
2. Thickness: 5/8 inch.

C. Foil-Faced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type I or Type II, Class 2, rigid, cellular, polyisocyanurate thermal insulation. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas EPS; a Division of Atlas Roofing Corporation.
 - b. Dow Chemical Company (The).
 - c. Rmax, Inc.
2. Thickness: 1.5 inch.
3. Min. aged R-value: 9.6 per inch
4. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
5. All joints shall be taped. Tape shall be approved by insulation manufacturer (in writing).
6. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.4 PARAPET SHEATHING

- A. Plywood Sheathing: , Exposure 1, Structural I sheathing, to meet delegated design for parapet construction in the wind zone of Lake Charles, LA.
 - 1. Span Rating: Not less than 32/16.
 - 2. Nominal Thickness: Not less than 5/8".

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached. Use corrosive resistant type screws.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. To be provided by Liquid applied Air Barrier installer.

2.7 MISCELLANEOUS MATERIALS

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
 - 4. Tape all joints with MFGR's approved tape.

5. **Apply a pvc L-Bead at edges of gypsum sheathing abutting dissimilar materials.**

6. Provide backer rod and sealant at joint.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.3 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 06 16 00

SECTION 064020 - ARCHITECTURAL WOODWORK

1.1 SUMMARY

A. Section Includes:

1. Wood cabinets for transparent finish.
2. Wood materials.
3. Cabinet hardware and accessories.
4. Miscellaneous materials.
5. Shop finishing.
6. **Reception Desk**

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 099000 "Painting" for field finishing of interior architectural woodwork.
3. Section 123661 Solid Surface Counters & Sills

1.2 COORDINATION

- #### A.
- Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Wood cabinets for transparent finish.
2. P.L. Clad Cabinets
3. P.L. Countertops
4. Wood materials.
5. Cabinet hardware and accessories.
6. Miscellaneous materials.
7. Shop finishing.

B. Shop Drawings: For architectural cabinets.

1. Include plans, elevations, sections, and attachment details.
2. Show **3" = 1'-0"** scale details.

3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 4. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.
 5. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
- C. Samples: For each exposed product and for each color and finish specified, in manufacturer's standard size.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Samples for Verification: For the following:
1. Lumber for Transparent Finish: Not less than **5 inches wide by 12 inches long**, for each species and cut, finished on one side and one edge.
 2. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished cabinets.
 3. Lumber and Panel Products with Shop-Applied Opaque Finish: **5 inches wide by 12 inches** long for lumber and **12 by 12 inches** for panels, for each finish system and color.
 - a. Finish **entire** exposed surface.
 4. Thermally Fused Laminate (TFL) Panels: **12 by 12 inches**, for each color, pattern, and surface finish.
 - a. Provide edge banding on one edge.
 5. Corner Pieces:
 - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, **18 inches** high by **18 inches** wide by **6 inches** deep.
 - b. Miter joints for standing trim.
 6. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers including wood doors where veneer matching includes door faces.

- D. Quality Standard: Unless otherwise indicated, comply with AWT's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: **Custom**
- B. Type of Construction: **Frameless**

- C. Door and Drawer-Front Style: **Flush overlay.**
- D. Wood for Exposed Surfaces: **As indicated on Drawings.**
 - 1. Species: **White birch**
 - 2. Cut: **Plain sliced/plain sawn**
 - 3. Grain Direction: **Vertically for drawer fronts, doors, and fixed panels.**
 - 4. Matching of Veneer Leaves: **Book match.**
 - 5. Veneer Matching within Panel Face: **Center-balance match.**
 - 6. .
- E. Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: **Thermally fused laminate panels.**
 - a. Edges of Thermally Fused Laminate Panel Shelves: **PVC or polyester edge banding.**
 - 2. Drawer Subfronts, Backs, and Sides: **Thermally fused laminate panels with PVC or polyester edge banding**
 - 3. Drawer Bottoms: **Thermally fused laminate panels**
- F. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with **glued rabbeted joints supplemented by mechanical fasteners.**

2.2 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: **Custom.**
- C. Type of Construction: **Frameless**
- D. Door and Drawer-Front Style: **Flush overlay.**
- E. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

F. Exposed Surfaces:

1. Plastic-Laminate Grade: **HPL.**
2. Edges: **PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.**
3. Pattern Direction: **Vertically for drawer fronts, doors, and fixed panels**

G. Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: **Thermally fused laminate panels.**
 - a. Edges of Plastic-Laminate Shelves: **PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.**
 - b. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.
 - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.
2. Drawer Sides and Backs: **Thermally fused laminate panels with PVC or polyester edge banding.**
3. Drawer Bottoms: **Thermally fused laminate panels.**

H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with **glued rabbeted joints supplemented by mechanical fasteners.**

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Arborite, W2003 AW, Coppered Artisan Walnut
 - b. Arborite, W465 LE, Matcha Modern Cherry
 - c. Solid colors, **matte** finish.
 - d. Solid colors with core same color as surface, **matte** finish.
 - e. Wood grains, **matte** finish.
 - f. Patterns, **matte** finish.

2.3 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Medium density fiberboard will not be allowed.
- C. Wood Species and Cut for Transparent: Clear select White Maple
- D. Wood Species for Opaque Finish: Any closed-grain hardwood or poplar
- E. Wood Products: Comply with the following:
 - 1. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 - 2. Hardwood Plywood and Face Veneers: HPVA HP-1.
- F. Clear Tempered Float Glass for Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; manufactured by horizontal (roller hearth) process, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.
- G. High-Pressure Decorative Laminate: minimum GP50 - .050" nominal, grades as indicated, or if not indicated, as required by woodwork quality standard.
- H. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- I. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- D. Wire Pulls: Back mounted, 4 inches long, 5/16 inches in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: Centerline bore @ 1 ½" o.c. with clear plastic mounts with stainless steel pins. .

- G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
 - 1. Box Drawer Slides: 100 lbf (440 N).
 - 2. File Drawer Slides: 150 lbf (670 N).
 - 3. Pencil Drawer Slides: 45 lbf (200 N).
 - 4. Keyboard Slide: 75 lbf (330 N).
 - 5. Trash Bin Slides: 150 lbf (670 N).
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041 (where noted on Drawings).
- J. Grommets for Cable Passage through Countertops: 2-inch o.d., color as selected by architect, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide "SG series" by Doug Mockett and Co., Inc.
- K. Product: Subject to compliance with requirements, provide Model "CP-2" by Doug Mockett and Co., Inc. Retractable TV Swivel – 150# rated.
- L. Retractable Sliding Door Type – as Manufactured by Blum, K&V, Haeffel.
- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Shall be BHMA 626 Satin Chromium.
- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- O. **Where counter is shown in plans indicating brackets provide either Rakks or Hafele equal for counters up to 25" deep. Contractor must provide any finish option that is available from the manufacturer, color to be determined. Provide every 16" o.c.**

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: **Softwood**, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.6 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease edges and corners to **1/16-inch** radius unless otherwise indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual."
 - 1. For glass in wood frames, secure glass with removable stops.
 - 2. For exposed glass edges, polish and grind smooth.

2.7 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISHING

- A. Quality Standard: Comply with AWI Section 300.
- B. Grade: Premium
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
- H. Wood Species and Cut: Clear Select White Maple.
 - 1. Provide split species on trim that face areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with cabinet surface.
 - 1. For shop-finished items, use filler matching finish of items being installed.
- D. Install cabinets level, plumb, and true in line to a tolerance of **1/8 inch in 96 inches (3 mm in 2400 mm)** using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. Maintain veneer sequence matching of cabinets with transparent finish.
- E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.
 - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- F. Field Finishing: See **Section 099123 "Interior Painting"** for finishing of installed architectural cabinets.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION 064020

SECTION 06 41 16 - PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See solid surface specification and

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plastic laminate casework, as shown in plans.
 - 2. Cabinets in Break Room

1.3 DEFINITIONS

- A. Exposed Portions of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 1200 mm above floor, and visible surfaces in open cabinets or behind glass doors.
- B. Ends of cabinets, including those installed directly against walls or other cabinets shall be considered exposed.
- C. Semi exposed Surfaces of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semi exposed.
- D. Concealed portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For plastic laminate casework. Include plans, elevations, details, and attachments to other work.
 - 1. Indicate locations of blocking and reinforcements required for installing

- laboratory casework.
 - 2. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
 - 3. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples for Initial Selection: Plastic laminate for cabinets and countertops, and other accessories required for casework.
- D. Samples for Verification: Unless otherwise directed, approved Sample units may become part of the Work. Notify Architect of their exact locations. If not incorporated into the Work, retain acceptable Sample units at Project site and remove when directed by Architect.
- 1. One full-size, finished base cabinet complete with hardware, doors, and drawers, but without countertop.
 - 2. One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves.

1.5 QUALITY ASSURANCE

- A. Source Limitations Obtain laboratory casework, including countertops and accessories, through one source from a single manufacturer.
- B. Product Designations: Drawings indicate size, configurations, and finish material of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes, similar door and drawer configurations, same finish material, and complying with the Specifications may be considered. Refer to Division 1 Section "Substitutions."
- C. Product Standards: Comply with SEFA 8, "Laboratory Furniture – Casework, Shelving and Tables-Recommended Practices & AWI standards for modular cabinets. ”.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.
- B. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 20 percent to 50 percent.

1.7 PROJECT CONDITIONS

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

the construction period.

1.8 WARRANTY

- A. Lifetime Guarantee and Limited Warranty to the owner against defective material and fabrication for as long as they own the product. This is a warranty of replacement and repair only; manufacturer shall correct defects in material and/or fabrication without charge.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Note: Local Millwork shops must be able to provide same or better construction, hardware as product specified.

- 1. Plastic Laminate Faced Casework:
 - a. LSI
 - b. Mardel Products Co (Mansura, LA)
 - c. Scanlon Taylor
 - d. C & C Millworks
 - e. Baton Rouge Millworks
 - f. Superior Millworks
 - g. Acoustical Specialties.
 - h. Gator Millworks

No exceptions

2.2 CABINET MATERIALS

A. PLASTIC LAMINATES:

- 1. Plastic laminate Vertical Surfaces: Grade VGS and VGP .028" thick.
- 2. Plastic Laminate – Horizontal Surfaces: Grade HGS .048" thick
- 3. Plastic Laminate – Post Formed Surfaces: Grade HGP .039" thick.
- 4. Selection from standard colors of Wilsonart, Fromica, or Nevamar as selected by Architect.

- B. Exposed Surfaces: Vertical and horizontal surfaces: Plastic Laminate.

C. Semiexposed Materials:

- 1. Thermal Fused melamine laminate.

- D. Door, Drawer, Body, & Countertop edges and exposed shelf edges.

1. 3mm pvc
- E. Concealed shelf edges
 1. 1 mm pvc.
- F. Open shelf edges
 1. 3 mm pvc.
- G. Plastic Laminate Counter tops (Re: Drawings for Solid Surface Top Locations)
 1. Industrial grade particle board, (use moisture resistant within 3' of sinks).
 2. Plastic Laminate: GP50 grade
 3. Edges: 3mm pvc.
- H. Base:
 1. Provide continuous 4" high recessed 3/4" thick treated plywood base at all sides to set cabinet flush with rear wall and to receive 4" rubber base. Provide intermediate support at bases 30" or deeper or wear needed to support cabinet weight.
- I. Concealed Materials:
 1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
 2. Plywood: hardwood plywood complying with HPVA HP-1.
 3. Plastic Laminate: Type BKL.
 4. Particleboard: ANSI A208.1, Grade M3.

Density	40-50 lbs/cu.ft
Moisture Content	10% Max
Modulus of Rupture	2393 psi
Modulus of Elasticity	398,900 psi
Internal Bond	80 psi
Hardness	500 pounds Min
Linear Expansion	0.35%
Thickness Tolerance	+/- 0.008"
Face Screw Holding	247 pounds Min
 5. Hardboard: AHA A135.4, Class 1 tempered.

2.3 CABINET DESIGN

- A. Flush overlay.

2.4 CABINET FABRICATION

- A. Construction: Provide plastic laminate faced laboratory casework of the following minimum construction:

1. Bottoms and Ends of Cabinets, Shelves, and Tops of Wall Cabinets and Tall Cabinets: $\frac{3}{4}$ inch thick particleboard, plastic laminate faced on exposed surfaces.
 2. Backs of Cabinets: $\frac{1}{2}$ inch thick particleboard, plastic laminate faced on exposed surfaces.
 3. Drawer fronts: $\frac{3}{4}$ inch thick particleboard, plastic laminate faced on both sides.
 4. Drawer Sides and Backs: $\frac{1}{2}$ inch thick solid wood or plywood, with glued dovetail or multiple dowel joints.
 5. Drawer Bottoms: $\frac{1}{4}$ inch thick plywood glued and dadoed into front, back and sides of drawers. Use $\frac{1}{2}$ inch thick material for drawers more than 24 inches in width.
 6. Doors 48 inches or Less in Height: $\frac{3}{4}$ inch thick, with particleboard or medium density fiberboard cores, solid wood stiles and rails, and plastic laminate faced on both sides.
 7. Doors More Than 48 inches in Height: 1-1/16 inches thick, with honeycomb cores, solid hardwood stiles and rails, and plastic laminate faced on both sides.
 8. Shelves 30" or less, $\frac{3}{4}$ " thick particleboard, Shelves 30" +, 1" thick particle board.
 9. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners as approved by the AWI Quality Standards 8th Edition - 2003 Sections 400A-T-12, 400B-T10 and 1600-T-11
- B. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinet fronts.

2.5 CABINET HARDWARE

- A. General: Provide laminate casework manufacturer's standard satin finish, commercial quality, heavy duty hardware complying with requirements indicated for each type.
- B. Hinges: Stainless steel, 5 knuckle hinges complying with BHMA A156.9, grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches or less in height, 3 for doors more than 48 inches in height.
- C. Pulls: Solid aluminum, stainless steel, or chrome plated brass; fastened from back with two screws. For sliding doors, provide stainless steel or chrome plated recessed flush pulls. Provide 2 pulls for drawers more than 24 inches in width.
- D. Door Catches: dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches in height.
- E. Drawer Slides: Powder coated, full extension, self closing, heavy duty drawer slides, designed to prevent rebound when drawers are closed; with nylon tired, ball bearing rollers; and complying with BHMA A156.9, Type B05091, and rated for 120 lbf (530 N).
- F. Locks: Cam type, brass with chrome plated finish; complying with BHMA A156.11, Type E07281.
 1. Provide minimum of two keys per lock and two master keys. Key Casework

differently per room. Lock core shall be removable with a control key, permitting Owner to easily change lock arrangements without tools.

2. Provide on all drawers and doors.

- G. Adjustable Shelf Supports: Mortise type, powder coated steel standards and shelf rests complying with BHMA A156.9, Types B04071 and B04091. **NO PLASTIC SHELF SUPPORTS ALLOWED!**

2.6 COUNTERTOPS

- A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch with continuous drip groove on underside ½ inch from edge.
- B. Plastic-Laminate Countertops: (see drawings for areas with solid surface tops)
 1. Countertops: Plastic laminate sheet, complying with NEMA LD3, shop bonded with waterproof adhesive to both sides of 1-3/16 inch thick core. Sand surfaces to which plastic laminate is to be bonded.
 2. Plastic laminate Type for Formed Countertops: HGP.
 3. Countertop Core: Particleboard complying with ANSI A208.1, Grade M3, (use moisture resistant type at sink locations.)
 4. Adhesive for Bonding Plastic Laminate: Urea-formaldehyde.
 5. Colors, Textures, and Patterns: As selected by Architect from plastic laminate manufacturer's full range.
 6. Construct top and backsplash from one piece of plastic laminate with rolled front and top edges and coved intersection. Provide separate end splashes of same material as top, fitted to top. Finish exposed ends with same plastic laminate as top.
 7. Countertop edge: Hot melt glue, machine applied 3mm PVC impact resistant edge. (Typical)

2.7 ACCESSORIES

- A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop, unless otherwise indicated.
- B. **Where shelving is shown in plans indicating brackets, please use the following (or approved equal). Hafele work surface brackets, rigid 18"X18"X18" color to be determined, contractor must provide any finish option that is available from the manufacturer. Provide every 16" o.c.**
- C. **Where counter is shown in plans indicating brackets provide either Rakks or Hafele equal for counters up to 25" deep. Contractor must provide any finish option that is available from the manufacturer, color to be determined. Provide every 16" o.c.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of plastic laminate laboratory casework.
- B. 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

- A. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Adjust top rails and subtops within 1/16 inch of a single plane. Fasten cabinets to utility space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Fasten adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
- C. Wall Cabinets: Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c. Align similar adjoining doors to a tolerance of 1/16 inch.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- E. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
- B. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop.
 - 1. Use concealed clamping devices for field joints in plastic laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.
- C. Fastening:
 - 1. Secure countertops, except for epoxy countertops, to cabinets with Z-type

- fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
- 2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Seal unfinished edges and cutouts in plastic laminate countertops with a heavy coat of polyurethane varnish.
- E. Provide scribe moldings for closures at junctures of countertop, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical resistant, permanently elastic sealing compound where recommended by manufacturer.
- F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF ACCESSORIES

- A. Install accessories according to Shop Drawings and manufacturer's written instructions.

3.5 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. Protect countertop surfaces during construction with 6 mil plastic or other suitable water-resistant covering. Tape to underside of countertop at minimum of 48 inches o.c.

3.6 CASEWORK – SEE DRAWINGS FOR LOCATIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Mockup – Provide a 3' side full size base cabinet (two drawers), with approved laminate as a mockup. Include backsplash. Deliver to site.

END OF SECTION 06 41 16

SECTION 07 19 00 WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:

1. Brick masonry.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of water repellent and substrate indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. PROSOCO, Inc.
 - c. Tnemec Inc.

- d. W.R. Meadows, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in representative locations by method recommended by manufacturer.
 - 2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - 3. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

3.2 PREPARATION

- A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.
- B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.
- C. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
- D. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply coating of water repellent on surfaces to be treated using low-pressure spray to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.
- C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between

coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. **SEE SECTION "075423" FOR INSULATION BOARD UNDER TPO ROOFING SYSTEM.**
- C. **SEE SECTION "07 41 13" FOR INSULATION BOARD UNDER STANDING SEAM METAL ROOF PANELS**

1.2 SUMMARY

- A. Section Includes:
 - 1. Polyisocyanurate foam-plastic board (re: 06 16 00 Sheathing)
 - 2. Polyisocyanurate foam-plastic board on exterior sheathing
 - 3. Glass-fiber blanket in all metal stud walls and above ceilings.
 - 4. Loose fill perlite insulation in cells of all cmu partitions between classrooms, full height of wall, (this does not interior walls)
 - 5. **Insulation is required at all new spaces between conditioned spaces and non-conditioned spaces, attics and walls.**
- B. Related Requirements:
 - 1. Section 04 20 00 "Unit Masonry" for insulation installed in masonry cells.
 - 2. Section 06 16 00 "Sheathing" for foam-plastic board sheathing installed directly
ACTION SUBMITTALS
 - 3. Metal Building Insulation specification
- C. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Polyisocyanurate Board, Foil Faced: ASTM C 1289, foil faced, Type I, Class 1 or 2.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas EPS; a Division of Atlas Roofing Corporation.
 - b. Dow Chemical Company (The).
 - c. Firestone Building Products.
 - d. Rmax, Inc.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 3. Thickness: 1.5" with an R value minimum of 9.6.
 - 4. Tape for joints: Foil Face as recommended by Manufacturer.

2.2 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Owens Corning.
 2. Provide full width and depth insulation, unfaced for use in metal stud walls. 3.5" = R-11, 6" = R-19
- B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 - c. Quiet batt wire insulation supports
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
 4. Use wire supports at purlins to secure batt insulation behind metal building vinyl faced insulation.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.3 Perlite Loose Fill Masonry Insulation

- A. Provide loose fill perlite in cmu cells (not filled with concrete reinforcing) at all exterior cmu walls and perimeter of music room (alternate #1).
1. Basis of Design: W.L. Tucker Supply Company Perlite Loose-Fill Masonry Insulation.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation on CMU: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 20 00 "Unit Masonry."
- B. Foam Plastic Board Insulation on Glass Matt Gypsum Sheathing: Install Panels with adhesive recommended by manufacturer. Tape all joints with aluminum faced tape as recommend by insulation manufactuer..

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
- C. Above acoustical ceiling tile: Provide R-13 unfaced batt insulation above all suspended acoustical ceilings such as the kitchen area.

3.5 PROTECTION

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

END OF SECTION 07 21 00

SECTION 07 26 00 - UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.1 SUMMARY

- A. Products Supplied Under This Section
 - 1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs, including the outdoor basketball courts.
- B. Related Sections
 - 1. Section 03300 Cast-in-place Structural Concrete
 - 2. Section 07260 Under-Slab Barrier.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM F 1249 or ASTM E 96
- B. American Concrete Institute (ACI)
 - 1. ACI 302.1R-96 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick

1.3 SUBMITTALS

- A. Quality Control / Assurance
 - 1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
 - 2. Manufacturer's samples, literature
 - 3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Vapor Barrier
 - 1. Vapor Barrier must have the following qualities
 - a. WVTR less than 0.01 as tested by ASTM E 96
 - b. ASTM E 1745 Class A (Plastics) **.01 perms or lower**
 - 2. Vapor Barrier Products
 - a. Vapor Vapor Check II .10 mils 0210 perms
 - b. Stego Wrap Class A - 10 mil. .0223 perms
 - c. Raven - Vapor Block 10 mil VB-10 - .0146 perms
 - d. W.R. Meadows Perminator 10 mil .016 perms

2.2 ACCESSORIES

- A. Seam Tape
 - 1. Tape must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96, 0.3 perms or lower
 - b. Must be approved by the vapor barrier manufacturer to be used as a system.
- B. Vapor Proofing Mastic
 - 1. Mastic must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96, 0.3 perms or lower
- C. Pipe Boots
 - 1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Ensure that subsoil is approved by architect or geotechnical firm
 - 1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

- A. Install Vapor Barrier/Retarder:
 - 1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
 - a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
 - b. **Lap Vapor Barrier/Retarder over structural fill and roll down to the bottom of footings.**
 - c. Overlap joints 6 inches and seal with manufacturer's tape.
 - d. Seal all penetrations (including pipes) per manufacturer's instructions.
 - e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
 - f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.
 - g. Turn down vapor barrier in ALL footings (to the bottom of the footing).

END OF SECTION 07260

SECTION 07 27 26 FLUID-APPLIED MEMBRANE AIR AND WATER BARRIERS

PART 1: GENERAL

1.1. GENERAL REQUIREMENTS

1. The General Conditions, Supplementary Conditions, Instructions to Bidders, and Division 01- General Requirements shall be read in conjunction with and govern this section.
2. The Specification shall be read as a whole by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractor the extent of their Work.

1.2. SUMMARY

1. This Section includes requirements for supplying labor, materials, tools, and equipment to complete the Work as shown on the Drawings Architectural Division as specified herein including, but not limited to, the following:
 1. Adhesives/Primers
 2. Fluid Applied, Vapor Permeable Air & Water Barrier Membrane
 3. Transition Membranes
 4. Sealing joints in wall sheathing
 5. Sealing all wall openings.
 6. Flashing around all wall openings including window, louvers, doors, etc.
 7. Insulation Adhesive

1.3. RELATED REQUIREMENTS

1. DIVISION 04 – Masonry Section 04 20 00 – Unit Masonry
2. DIVISION 06 – Wood, Plastics, and Composites Section 06 16 00 Sheathing
3. DIVISION 07 – Thermal and Moisture Protection Section 07 11 13 - Dampproofing and Waterproofing
4. DIVISION 07 – Thermal and Moisture Protection Section 07 21 00 - Thermal Insulation
5. DIVISION 07 – Thermal and Moisture Protection Section 07 62 00 - Sheet Metal Flashing and Trim
6. DIVISION 07 – Thermal and Moisture Protection Section 07 92 00 - Joint Sealants

1.4. REFERENCES

1. American Architectural Manufacturers Association (AAMA):
 1. AMMA 2400-02, Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction
2. American Society for Testing and Materials (ASTM):

1. ASTM D412, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers - Tension
2. ASTM D471, Standard Test Method for Rubber Property - Effect of Liquids
3. ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
4. ASTM D2243, Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
5. ASTM D5590, Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
6. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
7. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials
8. ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
9. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
10. ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
11. ASTM E1354, Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
12. ASTM E1677, Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls
13. ASTM E2112, Standard Practice for Installation of Exterior Windows, Doors and Skylights
14. ASTM E2178, Standard Test Method for Air Permeance of Building Materials
15. ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.5. ADMINISTRATIVE REQUIREMENTS

1. Coordination:
 1. Coordinate the Work of this Section with the installation of exterior substrate. Sequence Work so that installation of fluid-applied air barrier coincides with installation of substrate preparation without causing delay to the Work.
2. Pre-installation meetings:

Hold a preinstallation meeting with the manufacturer's product representative and certified installer. The architect and owner shall be present in this meeting. Show examples of product waterproofing on the site-built wall mockup especially around openings such as windows. For Tyvek, contact Chris Rupert to be in attendance: Phone number 504-908-9912.

- a. Meet with Owner, Architect, Manufacturer's Certified Installer and installers of work that interfaces with or affects weather barrier.
- b. Review methods and procedures related to weather barrier installation, including manufacturer's written instructions.
- c. Review and finalize construction, and verify availability of materials,

- Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- d. Examine substrate conditions and finishes for compliance with requirements.
- e. Review flashings, special weather barrier details, weather barrier penetrations, and condition of other construction that affects weather barrier.
- f. Review weather barrier manufacturer's Project registration and observation process.
- g. Review Construction Indoor Air Quality Management Plan "Moisture Protection for Absorbent Materials."
- h. Review temporary protection requirements for weather barrier during and after installation.

1.6. SUBMITTALS

1. Provide the following requested information in accordance with Submittal Procedures.
2. Action Submittals:
 1. Product Data:
 1. Air or Water Barrier Manufacturer's guide specification.
 2. Air or Water Barrier Manufacturer's complete set of technical data sheets for assembly.
 3. Air or Water Barrier Manufacturer's complete set of standard detail drawings.
 4. Provide Health Product Declarations (HPDs).
 5. Provide Environmental Product Declarations (EPD's).
 6. Retain first subparagraph below if seeking LEED Indoor Environmental Quality (EQ) Credit: Low-Emitting Materials.
 7. SDS (formerly MSDS), third-party certifications, or product technical data confirming systems that meet or exceed emissions guidelines for volatile organic compounds (VOCs) and hazardous air pollutants (HAPs), as follows:
 1. Commercial weather barrier complies with California Department of Public Health (CDPH) Standard.
 2. Adhesives and sealants wet-applied on-site that meet/exceed VOC content requirements for wet applied products comply with SCAQMD Rule 1168.
 3. Flashing systems comply with SCAQMD Rule 1168 on VOC limits.
 2. Certificates:
 1. Product certification that the assembly components are supplied and warranted by single source Air or Water Barrier Manufacturer.
 2. Statement that installing contractor is authorized by Air or Water Barrier Manufacturer to complete Work as specified.
 3. Shop Drawings:
 - a. Show details of weather barrier at terminations, openings, and penetrations.
 - b. Show details of weather barrier applications.

3. INFORMATIONAL SUBMITTALS

1. Manufacturer's Instructions: For installation of each product specified.
2. Qualification Data: For Installer.
3. Sample Warranty: For manufacturer's warranty.
4. Reports: Field test and inspection reports.
5. Installer's weather barrier manufacturer training certificate.

1.7. QUALITY ASSURANCE

1. Single Source Responsibility:
 1. Obtain fluid-applied membrane air barrier, transition membranes, air barrier sealants, primers, mastics, and adhesives from a single Air Barrier Manufacturer regularly engaged in the manufacturing and supply of the specified products.
 2. Contactor to verify product compliance with federal, state, and local regulations controlling use of Volatile Organic Compounds (VOC).
2. Manufacturer Qualifications:
 1. Air Barrier Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:
 1. Air Barrier Manufacturer must not issue warranties for terms longer than they have been manufacturing and supplying specified products for similar scope of Work.
3. Installer Qualifications:
 1. Perform Work in accordance with Air Barrier Manufacturer published literature and as specified in this section.
 2. Maintain one (1) copy of Air Barrier Manufacturer's instructions on site.
 3. At all times during the execution of the Work allow access to site by the Air Barrier Manufacturer representative.
 4. If meeting with Air Barrier Manufacturer during project construction, contact Air Barrier Manufacturer a minimum of two weeks prior to schedule meeting.

1.8. MOCK-UPS

1. Mock-ups: (include in the masonry wall mockup assembly)
 1. Where directed by architect construct mock-ups to verify selections made under submittals and to set quality standards for materials and execution.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9. DELIVERY, STORAGE, AND HANDLING

1. Delivery of Materials:
 1. Materials shall be delivered to the jobsite in undamaged and clearly marked containers indicating the name of the Air Barrier Manufacturer and product.
2. Storage of Materials:
 1. Store materials as recommended by Air Barrier Manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including but not limited to MSDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.
 2. Keep solvents away from open flame or excessive heat.
 3. Products should be stored in closed containers.
 4. Store rolled materials on end in original packaging.
 5. Protect rolls from direct sunlight until ready for use.
 6. Refer to Air Barrier Manufacturer published literature.
3. Handling:
 1. Refer to Air Barrier Manufacturer published literature.

1.10. SITE CONDITIONS

1. Environmental Requirements:
 1. No Work shall be performed during rain or inclement weather.
 2. No Work shall be performed on frost or wet covered surfaces.
2. Protection:
 1. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane.
3. Ensure all preparation Work is completed prior to installing fluid-applied membrane air barrier.

1.11. WARRANTY

1. Manufacturer Material Warranty:
 1. Provide Air or Water Barrier Manufacturer's standard material warranty.

PART 2: PRODUCTS

2.1 MANUFACTURERS

1. Source Limitations: Obtain weather barrier assembly components, including weather barrier, weather barrier flashing from same manufacturer as weather barrier or manufacturer approved by weather barrier manufacturer.

2.2 PERFORMANCE REQUIREMENTS

1. 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. High-Performance Installations:
 - A. For installation with one of the following building envelope performance or structural characteristics:
 1. Exceeding 65 mph (100 km/h) equivalent structural load.
 2. Exceeding 15 mph (24 km/h) equivalent wind-driven rain water infiltration.
 3. Buildings with 60 feet (18 m) or more total height above grade plane, as defined by the IBC.
 4. Construction with gypsum or cement-based exterior sheathing.
 5. Non-wood based primary structure such as steel, light-gauge steel, masonry, or concrete.

2.5 WEATHER BARRIER

1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; **Tyvek® Fluid Applied WB+™** or approved equal.
2. Fluid-Applied Membrane: ASTM E 2357 passed, Air Barrier Association of America (ABAA) evaluated air barrier assembly, and assembly water resistance in accordance with ASTM E 331; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E 84; UV stabilized for nine-month exposure; and acceptable to authorities having jurisdiction.
 - A. 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) when tested in accordance with ASTM E 2178.
 - B. 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 the ABAA.
 - C. Water Penetration Resistance, Product: Hydrostatic-head resistance greater than 92.5 inches (235 cm) in accordance with AATTC 127.
 - D. Water Penetration Resistance, Assembly: Assembly wall specimen described in ASTM E 2357 to water resistance in accordance with ASTM E 331 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)].

- E. Water-Vapor Permeance: Not less than 10 perms (570 ng/Pa x s x sq. m) in accordance with ASTM E 96/E 96M, Desiccant Method (Procedure A) or not less than 20 perms (1100 ng/Pa x s x sq. m) in accordance with ASTM E 96/E 96M, Water Method (Procedure B).
- F. Allowable UV Exposure Time: Not less than nine months, when tested in accordance with ASTM G 155 (accelerated weathering).
- G. Flame Propagation Test: Test materials and construction in accordance with NFPA 285.
- H. Weather barrier system shall have a VOC content of 30 g/L or less.
- I. Must be able to be applied in cold weather conditions.

2.5 WEATHER BARRIER FLASHING

1. Conformable Weather Barrier Flashing: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure of 176 deg F (80 deg C) for seven days.
 - A. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; FlexWrap™ NF or approved equal.
 - B. Conformability: Able to create a seamless sill pan extending up the jambs without cuts, patches, or fasteners.
 - C. Water Penetration: No leakage at 15 psf (720 Pa) in accordance with ASTM E 331.
 - D. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (-4 deg C) as Class A (without primer use).
 - E. 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. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure of 176 deg F (80 deg C) for seven days.
 - A. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® StraightFlash™ VF or approved equal.
 - A. Water Penetration: No leakage at 15 psf (720 Pa) in accordance with ASTM E 331.
 - B. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (-4 deg C) as Class A without primer use.
 - C. 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.
3. Primer for Flashings: Synthetic rubber-based product. Spray applied. Strengthen the adhesive bond at low temperature applications between weather products, such as self-adhered Flashing Products, Commercial Building Wraps, and common building sheathing materials.
 - A. Basis of Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; DuPont™ Adhesive Primer or approved equal.

- B. Peel Adhesion Test: Passes ASTM D 3330, Test Method F, for the following:
 - 1. Peel Angles: 0, 25, 72, and 180 degrees.
 - 2. Substrates: Concrete masonry units (CMU), exterior gypsum sheathing, oriented strand board (OSB), aluminum, and vinyl.
- C. Chemical Compatibility per AAMA 713: Pass.
- D. Flame Spread Index per ASTM E 84: 5.
- E. Smoke Development Index per ASTM E 84: 0.

2.6 FLUID APPLIED FLASHING AND SEALANT

- 1. Fluid Applied Flashing: Trowel or brush applied, non-water soluble, single component, silyl terminated polyether technology (STPE), vapor permeable, flashing material.
 - A. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Fluid Applied Flashing and Joint Compound+ or approved equal.
 - B. VOC Content: ASTM C 1250, less than 2 percent by weight and less than 30 g/L.
 - C. Water Vapor Transmission: ASTM E 96, Method B, greater than 20 perms at 25 mils (0.64 mm) thick.
 - D. Minimum Tensile Strength: ASTM D 412, 165 psi (1140 kPa).
 - E. Minimum Elongation at Break: ASTM D 412, 360 percent.
- 2. Fluid Applied Sealant: ASTM C 920
 - A. Extension-Recovery/Adhesion per ASTM C 736: 100 percent recovery.
 - B. Accelerated Weathering/Low Temperature Flexibility per ASTM C 793: Pass.
 - C. VOC Percentage by Weight per ASTM C 1250: Less than 2 percent.
 - D. VOC per ASTM C 1250: Less than 30 g/L.

2.7 DRAINAGE LAYER

- 1. Drainage Layer: Weather barrier membrane with drainage.
 - 1. Basis-of-Design Product: DuPont Safety & Construction: E. I. du Pont de Nemours and Company; Tyvek® Fluid Applied WB+™ and CommercialWrap® D or approved equal.
- 2. Drainability: 98 percent or greater when tested in accordance with ASTM E 2273.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - A. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - B. Verify that substrates have cured and aged for minimum time recommended in writing by weather barrier manufacturer.
 - C. Verify that substrates are visibly dry and frost-free.
 1. Fluid-applied weather barrier may be applied to damp surfaces.
 2. Surfaces are considered damp if there is no visible water on the surface, and no transfer of water to the skin when touched.
 3. Apply accessory products only to clean and dry surfaces.
 - D. Verify that substrates are free of efflorescence and mold.
 - E. Verify that masonry joints are flush and filled with mortar.
 - F. Verify that top-of-wall system has been capped or covered to prevent water getting behind the facade and into wall cavity.
 - G. Verify continuous path for moisture drainage.
 1. Verify that continuous path for drainage is not blocked or disrupted, which results in excess moisture buildup in wall cavity.
 - H. Verify that surfaces to receive weather barrier are above grade.
2. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.
 - A. Verify that rough sill framing for doors and windows slopes downward towards the exterior and is level across width of opening.
- B. Verify air and surface temperatures are above 25 deg F (4 deg C) with a maximum surface temperature of 140 deg F (60 deg C). Do not install once ambient temperature exceeds 95 deg F (35 deg C), unless surface is shaded.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

1. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
2. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
3. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

4. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
5. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
6. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
7. When spraying is method of application, taper ends of the joint treatment to assist maintaining a wall system free of pinholes and voids.
8. Treat all non-moving transition joints to beams, columns, and dissimilar materials by applying a **2-inch- (50-mm-)** wide by **60-mil- (1.5-mm-)** thick coat of fluid-applied flashing across the joint.
9. Apply **25-mil- (0.6-mm-)** thick coat of fluid-applied flashing, extending a minimum **2 inches (51 mm)** on each surface, and treat the following conditions:
 - A. Joints up to **1/4 inch (6 mm)**.
 - B. Joints **1/4- to 1/2-inch (6- to 13-mm)**; reinforce with fiberglass-mesh tape.
 - C. Joints and transitions up to **1 inch (25 mm)**; treat using strip flashing.
10. Bridge isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.
11. When spraying is method of application, taper ends of fluid applied corner treatment to wall substrate.
12. Treat inside and outside corners by applying a **25-mil- (0.6-mm-)** thick coat of fluid applied weather barrier a minimum **2 inches (50 mm)** on each adjoining surface. Apply fillet bead of fluid-applied sealant to inside corners to ensure continuity. Alternatively, treat corners using strip flashing. Press strip flashing into inside corners; ensure that it is fully adhered to substrate.
13. Seal penetrations using fluid-applied flashing or sealant. Extend fillet bead **1/2 inch (13 mm)** onto both surfaces.
14. Treat embedded masonry anchors by applying a coat of fluid-applied weather barrier or fluid-applied flashing around base of the anchor.

3.3 ACCESSORIES INSTALLATION

1. Install accessory materials in accordance with air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - A. Coordinate installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - B. Install transition strip on roofing membrane or base flashing, for a minimum **3 inches (75 mm)** coverage over each substrate.

- C. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow to dry.
 - D. Use recommended primer when applying self-adhered flashing products on concrete, masonry, and fiber faced exterior gypsum board substrates. Priming is generally not required for adhering self-adhered flashing products to wood. However, adverse weather conditions or colder temperatures may require a primer to promote adhesion. Priming is not required when applying fluid-applied products, except on cut edges of exterior gypsum sheathing.
 - E. Apply pressure along entire surface of strip flashing for good bond using a J-roller or firm hand pressure. Remove all wrinkles and bubbles by smoothing surface and repositioning as necessary.
- 2. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
 - 3. When applying self-adhered flashing products over a cured fluid-applied membrane, first apply a wet bed of fluid-applied product.
 - 4. Seal fasteners of mechanically attached supports or furring strips in high-performance building envelope designs. Retain applicable subparagraph(s) below when using DuPont product as basis of design.
 - A. Apply double-sided butyl tape to back of support bracket at fastener location.
 - B. Embed support bracket into an additional wet bed of fluid applied product.
 - C. Adhere butyl-based flashing patch to wall at fastener location.
 - D. Use alternate method as approved by the manufacturer.
 - 5. At end of each working day, seal top edge of strips and transition strips to substrate with manufacturer approved product.
 - 6. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
 - 7. Flashing Sill Area for Windows and Doors:
 - A. Use ~~6-inch-~~ (150-mm-) wide conformable flashing for ~~2- by 4-inch~~ (50- by 100-mm) framing and ~~9-inch-~~ (220-mm-) wide conformable flashing for ~~2- by 6-inch~~ (50- by 150-mm) framing. When rigid back dams are required or desired, one option to use is a ~~3/4-inch~~ (19 mm) corner guard (back dam), cut to length of sill, and nailed into place on interior edge of sill prior to installation of ~~9-inch-~~ (220-mm-) wide conformable flashing. Afterward, install ~~9-inch-~~ (220-mm-) wide conformable flashing over sill and corner guard back dam.
 - B. Install without stretching conformable flashing when installing along sills or jambs. Conformable flashing is intended to be stretched when covering corners or curved sections.
 - 8. Apply fluid-applied flashing products from head of opening down. Use a corner trowel to smooth corners.

9. Repairs:

- A. Coat small damaged areas with layer of fluid-applied product.
- B. Reinforce large damaged areas with fiberglass mesh or replace damaged substrate before reapplying fluid-applied product.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. LOCATIONS: Exterior Face of CMU behind brick veneer, glass matt sheating, and/or other finishes. APPLY AT ALL PENENTRATIONS THRU EXTERIOR WALLS.

- 1. Apply air-barrier material to form a seal with strips and transition strips, and to achieve a continuous air barrier in accordance with air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - A. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - B. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - C. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
 - D. Fluid applied products may be overcoated once a touch-free skin has formed. Exterior insulation and cladding may be installed once the membrane has cured sufficiently to resist damage during installation.
- 2. Apply air barrier material in accordance with air-barrier manufacturer's written instructions and recommendations.
 - A. Roller Application:
 - 1. Nap rolling: Use a roller cover with a 1/2- to 3/4-inch (13- to 19-mm) nap.
 - B. Spray Application:
 - 1. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
 - 2. Use spray guard.
 - 3. Back Rolling: Use a roller cover with a 1-1/2- to 3/4-inch (13- to 19-mm) nap. Apply fluid-applied product in a single coat at 25 mils (0.64 mm) thick. Control thickness by applying appropriate volume over a marked area and spot checking with a wet-mil gauge.
 - C. Integrate fluid-applied product with through-wall flashing and window and door flashing by overlapping flashing with fluid-applied product a minimum 2 inches (50 mm).
 - D. Inspect surfaces to ensure that fluid-applied products are continuous and free of any voids or pinholes.

- E. Do not cover air barrier until it has been tested and inspected by the testing agency.
- F. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

1. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
2. Testing Agency: Engage a qualified third-party testing agency to perform tests and inspections.
3. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - A. Continuity of air-barrier system has been achieved throughout the building envelope without gaps, holes, or pinholes.
 - B. Air-barrier dry film thickness.
 - C. Continuous structural support of air-barrier system provided.
 - D. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - E. Site conditions for application temperature, and dryness of substrates are maintained.
 - F. Maximum exposure time of materials to UV deterioration not exceeded.
 - G. Surfaces primed, where applicable.
 - H. Laps in strips and transition strips comply with minimum requirements, are shingled in correct direction (or mastic applied on exposed edges), and are without fishmouths.
 - I. Termination mastic applied on cut edges.
 - J. Strips and transition strips firmly adhered to substrate.
 - K. Compatible materials used.
 - L. Transitions at changes in direction and structural support at gaps provided.
 - M. Connections between assemblies (air-barrier and sealants) comply with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - N. Each penetration sealed.
4. Field Quality Control Testing: Perform the following test on representative areas of structural sealant glazed curtain walls.
 - A. Air Infiltration Whole Building: ASTM E 779 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).
 - B. Water Penetration: ASTM E 1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article in Part 2, but not less than [**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. (600 Pa)**]. No water penetration shall occur as defined in ASTM E 1105.
 1. Perform a minimum of two tests in areas as directed by Architect.
 2. Perform tests in each test area as directed by Architect. Perform a minimum three tests, prior to 10, 30, and 70 percent completion.

- C. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in accordance with ASTM D 4541 for each [600 sq. ft. (56 sq. m)] of installed air barrier or part thereof.
- 5. Air barriers will be considered defective if they do not pass tests and inspections.
 - A. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - B. Remove and replace deficient air-barrier components for retesting as specified above.
- 6. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- 7. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- 1. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.
 - A. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
 - B. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- 2. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- 3. Remove masking materials after installation.

END OF SECTION

SECTION 07 41 13 – STANDING SEAM METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preformed, prefinished metal roofing and flashings.
- B. Miscellaneous trim, flashing, closures, drip flashing, and accessories.
- C. Sealant
- D. Fastening devices
- E. Vapor Shields

1.02 RELATED SECTIONS

- A. Section 06 10 00: Rough Carpentry.
- B. Section 07 90 00: Sealants.

1.03 REFERENCES

- A. American Iron & Steel Institute (AISI) Specification for the Design of Cold formed Steel Structural Members.
- B. ASTM A-525 Steel Sheet, Zinc-Coated (Galvanized)
- C. ASTM E-1680
- D. ASTM E-1646
- E. ASTM E-1592
- F. Spec Data Sheet - Aluminum Zinc Alloy Coated Steel (Galvalume) Sheet Metal by Bethlehem Corp.
- G. SMACNA - Architectural Sheet Metal Manual.
- H. Building Materials Directory - Underwriter's Laboratories, Test Procedure 580.

1.04 ASSEMBLY DESCRIPTION

- A. The roofing assembly includes continuous, (no joints), preformed sheet metal panels, related accessories, eaves, corners, rakes, gutters & downspouts, miscellaneous flashing and attaching devices.

1.05 SUBMITTALS

- A. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
- B. Submit a sample of each type of roof panel, complete with factory finish.
- C. Submit results indicating compliance with minimum requirements of the following performance tests:
 - 1. Air Infiltration ASTM E 1680
 - 2. Water Infiltration ASTM E 1646

3. Wind Uplift – IBC 2018, all roof zones. 120 mph wind speed.

- D. Submit calculations with registered engineer seal, verifying roof panel and attachment method resists wind pressures imposed on it pursuant to applicable building codes.
- E. Submit details and approval of roofing system to be applied on a metal building frame system.
- F. Submit the sample warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in Architectural Sheet Metal Products with ten (10) years minimum experience.
- B. No product substitutions shall be permitted without meeting specifications.
- C. Substitutions shall be submitted 10 Days prior to Bid Date and acceptance put forth in an addendum.
- D. No substitutions shall be made after the Bid Date.
- E. The work cannot be subcontracted to another roofer or sub, other than the prime roofing sub-contractor on the project.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
- B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.
- C. Panels with strippable film must not be stored in the open, exposed to the sun.
- D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.08 WARRANTY

- A. Special Galvalume Substrate Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, or perforating.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: 40 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

- b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, chipping, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 40 years from date of Substantial Completion.
- C. Special Watertightness Warranty: Manufacturer's **standard form** in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain watertight, including leaks, within specified warranty period.
 1. Warranty Period: **20** years from date of Substantial Completion.
 2. Shop drawings must be provided by, reviewed, and approved by panel manufacturer prior to panel system installation.
 3. Inspections by panel system manufacturer technical representative are required. Perform first inspection when underlayment and flashing are in place and second inspection when the roof is complete.
- D. Special Installer Warranty: Furnish a written warranty signed by the Panel Applicator guaranteeing materials and workmanship for watertightness of the roofing system, flashings, penetrations, and against all leaks.
 1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Basis of Design: Berridge Manufacturing Company, Houston, Texas. Zee-Lock Double-Lock Seam Roof. Continuous roll, nominal 16" wide and 2" high.
- B. Pac Clad (match Berridge product)

2.02 SHEET MATERIALS

- A. Prefinished Metal shall be Hot-Dipped Galvanized - ASTM A446-85 Grade C G90 Coating A525-86 24 Gauge core steel.
- B. Finish shall be full strength Kynar 500 Fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier.
- C. Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed before installation.

- D. Finish Colors: make all standard colors available for selection to architect. Metallic selections are not required.
- E. Gutters, downspouts, and trim will have standard colors for selection and the architect reserves the right to choose an accent trim color, other than that color of the roof.

2.03 ACCESSORY MATERIALS

- A. Fasteners: Galvanized Steel with washers where required.
- B. Sealant: Sealant must be an ultra low modulus, high performance, one-part, moisture curing silicone joint sealant. (do not use a clear sealant or sealants which release a solvent or acid during curing).

Sealant must be resistant to environmental conditions such as wind loading, wind driven rain, snow, sleet, acid rain, ozone, ultraviolet light and extreme temperature variations.

Features must include joint movement capabilities of +100% & -50% ASTM C-719, capable of taking expansion, compression, transverse and longitudinal movement, service temperature range -65°F to 300°F (-54°C to 149°C), Flow, sag or slump: ASTM C-639; Nil, Hardness (Shore A): ASTM C-661; 15, Tensile strength at maximum elongation: ASTM D-412; 200 psi, Tensile strength at 100% elongation: ASTM D-412; 35 psi, Tear strength, (die "C"); ASTM D-624; 40 pli, Peel strength (Aluminum, Glass, Concrete): ASTM C-794; 30 pli

- C. Vinyl Weather Seal Insert.
- D. ROOF DRAINAGE SYSTEM INSTALLATION
 - 1. If SMACNA's "Architectural Sheet Metal Manual" is not standard office practice in the area of Project, substitute another standard in this article such as "The NRCA Roofing and Waterproofing Manual."
 - 2. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- E. Hanging Gutters: 24-gauge pre-finished galvanized steel to match metal roof material. Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.
 - 2. Provide a continuous preformed angle shim to keep gutter plumb and level between the back of the gutter and the fascia.
 - 3. Loosely lock straps to front gutter bead and anchor to roof deck.
 - 4. Anchor and loosely lock back edge of gutter to continuous cleat.
 - 5. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.

6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- F. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between. Profile of gutter must follow wall shape.
 2. Provide elbows at base of downspout to direct water away from building. Turn downspout out and down into catch basin grate.
 3. Connect downspouts to underground drainage system indicated.
- G. Downspout Boots: Cast aluminum downspout boots at all downspouts. Rectangular downspout to round discharge outlet designed to tie into A2000 pipe. Provide all necessary hubs and fittings to make the transition and connection. Paint boots to match finish of metal downspout (comes with factory prime coat and contractor shall provide finished oil-based paint – match gloss finish of metal downspout).
1. Basis of Design: Barrycraft B25A series.
 2. J.R. Hoe

2.04 FABRICATION

- A. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- B. Hem all exposed edges of flashing on underside, 1/2 inch.

2.05 PREFORMED METAL PANELS

A. HIGH SEAM Zee Lock-Double Lock PANEL

1. 2" high vertical legs shall be spaced at 16" on-center.
2. Panels shall be site-formed with the manufacturer's Portable Roll Former in continuous lengths.
3. Continuous Zee Rib shall be 1-3/8" wide and 2-1/8" in height. Rib shall be connected to Zee Clips spaced at 3'-0" on solid substrate.
4. Vinyl Weather seal (U.S. Patent 5134825) to be factory-installed over Continuous Zee Rib as required.
5. Side lap to be mechanically seamed with a powered seamer.
6. Panel assembly to bear Underwriters Laboratories Label UL90, pursuant to Construction Number 312 for open framing conditions, either uninsulated or with blanket insulation; 335 or 335 (mod.) with rigid board insulation or 403 over solid substrate and applicable Fire Ratings.

7. Certification shall be submitted, based on independent testing laboratory, indicating no measurable water penetration or air leakage through the system when tested in accordance with ASTM E-1680-95 and ASTM E-1646-95.
8. Provide striations in panel to help against oil canning.

CONTINUOUS STANDING SEAM METAL PANELS SHALL BE PLACED WITH NO LAP SEAMS.

B. Underlayment:

1. On all standing seam areas under standing seam (top of polyiso): (and adjacent overhangs). One Layer of 40mil W.R. Grace Ice and Water Shield, Atlas, or Tamko TW, self-adhering membranes. (high temp) and Water Shield or Tamko TW, self-adhering membranes. (high temp).
2. Ensure waterproof membrane installed horizontally, starting at eave to ridge with a 6" minimum overlap and 18" end laps.

C. Rigid Insulation Board

1. Polyisocyanurate rigid closed cell foam board with a universal asphalt impregnated/ and or fiber glass reinforced, water resistant face. Minimum conditioned R-value for 6" thick cross section = R-34.8. The rigid insulation board must be compatible for standing seam metal roofing systems and the system specified in this specification section.
2. Provide maximum size boards, min. size = 4' x 8'. Lay layers of 2 – 3" layers as per manufacturer's recommendations for curved roof radius. Stagger all joints each way, Anchor with large felt type screw anchors with hot dipped galvanized screws.
3. Special care shall be taken to install fasteners into high section of exposed acoustical deck.
4. Manufacturers:
 - a. Atlas AC Foam 2
 - b. GAF Energy Guard
 - c. Or approved equal

3.02 INSTALLATION

- A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation. Work from high to low areas, only install as much work as can be dried in after a days work.
- B. Install fiberglass acoustical batt insulation in cellular metal deck, (insulation provided by deck manufacturer.) Only over conditioned areas.
- C. Immediately install waterproof membrane over deck.
- D. Install rigid insulation board with large plastic plate and hot dipped galvanized screws in proper screw pattern per code. Install board in two or three layers
- E. Immediately install waterproof membrane over deck.
- F. Install starter and edge trim before installing roof panels.
- G. Remove protective strippable film prior to installation of roof panels.

- H. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings. Provide bearing plates as required on rigid roof insulation.
- I. Install sealants for preformed roofing panels as approved on shop drawings.
- J. Do not allow panels or trim to come into contact with dissimilar materials.
- K. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
- L. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
- M. Remove and replace any panels or components which are damaged beyond successful repair.

3.03 CLEANING

ENSURE THAT NO METAL CUTTINGS AND/OR LOOSE FASTENERS ARE ON ROOF SURFACE. THIS HAS CAUSED SCRATCHING AND RUSTING ON PAST PROJECTS, WHICH CAN CAUSE FAILURES IN WARRANTY.

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
- B. Remove all scrap and construction debris from the site.
- C. Any scratched, dented, or oil canned panels will be rejected.

3.04 FINAL INSPECTION

- A. Final inspection will be performed by a manufacturer's rep before roof warranty is issued.

END OF SECTION 07 41 13

Section 07 54 23 - Thermoplastic-Polyolefin (TPO) Roofing

1.1 SUMMARY

- A. Section Includes
 - 1. Thermoplastic Single-Ply Roofing
 - 2. Insulation
- B. Related Sections
 - 1. Section 06 10 00: Rough Carpentry
 - 2. Section 07 62 00: Sheet Metal Flashing and Trim
 - 3. Section 22 10 10: Plumbing Specialties

1.2 REFERENCES

- A. Factory Mutual (FM Global) - *Approval Guide*
- B. Underwriters Laboratories (UL) - *Roofing Systems and Materials Guide* (TGFU R1306)
- C. American Society for Testing and Materials (ASTM) - *Annual Book of ASTM Standards*
- D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - *Architectural Sheet Metal Manual*
- E. National Roofing Contractors Association (NRCA)
- F. American Society of Civil Engineers (ASCE)

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.
- B. Roofing Manufacturer shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.5 SUBMITTALS

- A. Product Data: Provide product data sheets for each type of product indicated in this section.
- B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified. Provide drawings of all details on 24x36 sheets, scaled. Indicate all connections, insulation thicknesses, lap seams, parapet, cants, flashing, etc. Include an entire roof plan with referenced drawing sections and details that match the detail callouts of the

project drawings. Include the roofing installers contact information and provide proof of 10 years of experience in TPO installation. Include the sample warranty with the submittal. The installer must be the primary sub for roofing and not sub contract sections of the roof, parapet, or other components to other entities. The installer must provide a letter of recommendation from the manufacturer that they are a capable installer – provide 5 examples of projects completed of similar size.

- C. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.
- D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.
- E. Submit results indicating compliance with minimum requirements of the following performance tests:
 - 1. Air Infiltration ASTM E 1680
 - 2. Water Infiltration ASTM E 1646
 - 3. Wind uplift – IBC 2018, all roof zones. 120 mph wind speed
- F. Submit Calculations with registered engineer seal, verifying roof panel and attachment method resists wind pressures imposed on it pursuant to applicable building codes
- G. Submit details and approval of roofing system to be applied on a metal building frame system
- H. Submit the sample warranty

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Roofing Manufacturer shall provide a roofing system that meets or exceeds all criteria listed in this section.
- B. Installer's Qualifications:
 - 1. Installer shall be classified as a **Master** contractor as defined and certified by roofing manufacturer.
- C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.
- D. Final Inspection
Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.7 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, roofing manufacturer's representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.8 REGULATORY REQUIREMENTS

- A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.
- B. Wind uplift calculations by a licensed engineer in the State of Louisiana shall be submitted. Engineered wind calculations shall meet or exceed the regulatory requirements for the project zone (Central, Louisiana – EBR Parish).

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry manufacturer's label.
- B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
- D. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.
- E. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

1.10 PROJECT CONDITIONS

- A. Environmental Requirements & Restrictions
 - 1. Proceed with roofing only when existing and forecasted weather conditions permit.
 - 2. Make sure the TPO welding tool(s) is set up properly for the ambient temperatures present.

1.11 WARRANTY

- A. Provide Manufacturers standard Guarantee with single source coverage and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
 - 1. Duration: Twenty (20) years from the date of completion.

B. Applicator shall furnish a **non-prorated** NDL warranty covering water tightness of the roofing system for the period of twenty years from the date of substantial completion. Any legal disputes will be adjudicated in civil court of West Baton Rouge Parish, state of Louisiana.

C. **wind speed not less than 120mph in conjunction with the components and cladding pressures noted on the structural drawings for the project will be required to be documented in the warranty.**

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. BASIS OF DESIGN **GAF** - 1 Campus Drive, Parsippany, NJ 07054
- B. Johns Manville

- C. Carlisle Syn Tec
- D. Firestone

NO EXCEPTIONS

2.2 INSULATION (Basis of Design – GAF energy guard, all other listed manufacturers must meet or exceed specifications listed)

- A. Rigid polyisocyanurate board, with a glass-reinforced cellulosic felt facer. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 1, Grade 2. **EnergyGuard™ Polyiso Insulation**, with the following characteristics:
 - 1. Board Thickness: 2 layers 2.5” – Total 5”
 - 2. Thermal Resistance (LTTR value) of: Each layer 14.4 – Total 28.8
 - 3. Compressive Strength: 20 psi
- B. Rigid polyisocyanurate cover board, with coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam conforming to or exceeding the requirements of ASTM C 1289, Type 2, Class 4, Grade 1. **EnergyGuard™ HD Polyiso Insulation**, with the following characteristics:
 - 1. Board Thickness: ½” or 12.7mm
 - 2. Minimum Compressive Strength: 80psi (551kPa)
 - 3. Thermal Resistance (LTTR value) of: >2.5
- C. Rigid, tapered polyisocyanurate board, with a glass-reinforced cellulosic felt facer. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 1, Grade 2. **EnergyGuard™ Tapered Polyiso Insulation**, with the following characteristics:
 - 1. Board Thickness: Tapered for crickets only
 - 2. Thermal Resistance (LTTR value) of: varies
 - 3. Compressive Strength: 20 psi

2.3 MEMBRANE MATERIALS (Basis of Design – GAF Everguard, all other listed manufacturers must meet or exceed specification listed)

- A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 0.060 inch (60 mil) thickness, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved. White membrane is Energy Star Listed, CRRC Listed and Title 24 Compliant. **EverGuard® TPO 60 mil** thermoplastic single-ply roofing membrane by GAF.
 - 1. 10’ X 100’, each roll contains 1000 sq.ft. of roofing material weighing 322 lbs. Each half sheet roll contains approximately 500 sq.ft. of roofing material, 5’ X 100’, weighing 162 lbs.

2.4 FLASHING MATERIALS

- A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 0.060 inch (60 mil) thickness, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved. White membrane is CRRC Listed and Title 24 Compliant. BASIS OF DESIGN: **EverGuard TPO 60 mil** thermoplastic single-ply roofing membrane by GAF.

2.5 ADHESIVES, SEALANTS and PRIMERS

- A. Solvent-based Bonding Adhesive: Solvent based rubberized adhesive for use with EverGuard TPO membranes, **1121 Bonding Adhesive**, by tpo manufacturer.

- B. Solvent based liquid, required to protect field cut edges of EverGuard TPO membranes. Applied directly from a squeeze bottle, **TPO Cut Edge Sealant**, by tpo manufacturer.
- C. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **TPO Primer** by tpo manufacturer.
- D. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, **TPO Seam Cleaner**, by tpo manufacturer.
- E. Solvent based, trowel grade synthetic elastomeric sealant. Durable and UV resistant suitable for use where caulk is typically used. Available in 10 oz. tubes, **Caulk Grade Roof Sealant** by tpo manufacturer.
- F. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr. ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, **FlexSeal Roof Sealant**, by tpo manufacturer.
- G. Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **TPO Low VOC Primer**, by tpo manufacturer.
- H. Low VOC TPO cleaner designed to clean exposed or contaminated seams prior to heat welding to remove any residual soap or revitalize aged membranes. Contains only 50 grams per liter of Volatile Organic Content and has been formulated using a blend of primarily VOC-exempt ingredients to be in compliance with air quality regulations for single ply roofing products. **CleanWeld® Cleaner** by tpo manufacturer.
- I. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. **Water Block**, by tpo manufacturer.
- J. One-part, moisture-cure, self-leveling sealant designed for use in pitch pans on single ply roof systems. **One-Part Pourable Sealant**.

2.6 ACCESSORIES

- A. Mechanical Fasteners
 - 1. **Drill•Tec® XHD Screws**: Heavy gauge alloy steel fastener with CR-10 coating with a .275" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on heavy steel decks.
 - 2. **Drill•Tec® RhinoBond® TPO XHD Plates**: Galvalume, 3" (7.6 cm) diameter, specially coated for use in attachment systems.
- B. Flashing Accessories
 - 1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. **Detailing Membrane**, by tpo manufacturer.

2. An 8 inch (20 cm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green **TPO Flashing Membrane**, by tpo manufacturer.
3. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6" on center or 8" on center. 3/4" x 10' with 0.090" cross section, **Lip Termination Bar**, by tpo manufacturer.
4. A 6 inch (14 cm) wide, smooth type, heat-weldable polyester scrim reinforced thermoplastic polyolefin membrane strip. Designed for use as a cover strip over non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6" X 100'. **TPO Heat-Weld Cover Tape**, by tpo manufacturer.
5. A 6 inch (14 cm) wide, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip with a factory laminated butyl tape. Designed for use as a cover strip over non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6" X 100'. **TPO Cover Tape**, by tpo manufacturer.
6. Solvent based liquid, required to protect field cut edges of TPO membranes. Applied directly from a squeeze bottle, **TPO Cut Edge Sealant**, by tpo manufacturer.
7. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr. ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, **FlexSeal Roof Sealant**, by tpo manufacturer.
8. .045" reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6" x 100', **RTA (Roof Transition Anchor) Strip™**, by tpo manufacturer.
9. 24 gauge steel with 0.025" thick TPO based film as required for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. Standard sheet size 4' x 10', sheet weight 47 lbs. Custom sizes available, **TPO Coated Metal**, by tpo manufacturer.

C. WALL & CURB ACCESSORIES

1. 55 mil TPO membrane and 24 gauge coated metal prefabricated into standard and custom size thru wall scuppers. See plan details for scupper sizes
2. .045" thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs. Four corners are required to flash the curb, **Corner Curb Wraps** by tpo manufacturer.
3. 0.045" thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard TPO membrane. Size 4" x 4" with 6" flange **TPO Universal Corners** by tpo manufacturer.
4. 0.055" molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard TPO membrane. Size 6" x 6" x 5.5" high **Preformed Corners** by tpo manufacturer.
5. 8" diameter, nominal .050" vacuum formed unreinforced TPO membrane for use in flashing outside

corners of base and curb flashings, **TPO Fluted Corner** by tpo manufacturer.

D. PENETRATION ACCESSORIES

1. 0.075" thick molded TPO membrane sized to accommodate most common pipe and conduits, (1" to 6" diameter pipes), including square tube. Hot-air welded directly to EverGuard TPO membrane, supplied with stainless steel clamping rings, **TPO Preformed Vent Boots** by tpo manufacturer.
2. 0.045" thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes, **TPO Split Pipe Boots** by tpo manufacturer.
3. 0.045" thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes, **TPO Square Tube Wraps**, by tpo manufacturer.
4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h). **TPO Pourable Sealer Pocket**
5. Constructed from spun aluminum and preflashed using .055" thick smooth type, unreinforced thermoplastic polyolefin membrane. Available in a wide range of sizes to allow a proper fit into any size roofing drain. **TPO Drain** by tpo manufacturer.
6. Aluminum drain unit coated with a weldable TPO compound. TPO membrane can be heat welded directly to the drain body, resulting in a strong, secure installation. Each drain is fitted with a BlueSeal® mechanical drain seal for a secure, tight seal into the building drain system. Available in two sizes (3" and 4"), and custom sizes are available. **TPO Coated Metal Drain** by tpo manufacturer.

E. ROOF EDGE ACCESSORIES

1. Pre finished Metal fascia with continuous galvanized steel spring cant, exterior decorative snap-on fascia and available in 10 foot lengths in standard or custom colors. Details shall be approved by roofing manufacturer for application and by architect. See sheet metal and flashing specification.

F. FIELD OF ROOF ACCESSORIES

1. .055" thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. **-Joint Patches**, by roofing manufacturer.
2. 1/8" thick extruded and embossed TPO roll 34" x 50", heat welds directly to roofing membrane. Unique herringbone traction surface. Provide in gray, **TPO Walkway Rolls**, by roofing manufacturer. Provide walkways from roof access point to all mechanical units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that the surfaces and site conditions are ready to receive work.

- B. Verify that the deck is supported and secured.
- C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
- D. Verify that the deck surfaces are dry and free of ice or snow.
- E. Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.

3.2 SUBSTRATE PREPARATION

A. Steel Deck

- 1. Metal decks must be a minimum uncoated thickness of 22 gauge (0.8 mm) and shall have a G-90 galvanized finish on all panels. FM requirements may supersede those set forth in this section. Consult the current FM Guide for more information.
- 2. Decks must comply with the gauge and span requirements in the current Factory Mutual FM Approval Guide and be installed in accordance with Loss Prevention Data Sheet 1-28 or specific FM approval.
- 3. Where TPO is applied over acoustical decks, install acoustical deck insulation prior to start of TPO roofing and insulation system. Roofing fasteners shall not be exposed at interior exposed deck areas. Fasteners shall be installed in the "high points" of the deck system, to remain concealed. It is the installer's responsibility to place chalk lines or any other means necessary to understand deck attachment areas. Any fasteners in view at interior will be rejected.

3.3 INSTALLATION - GENERAL

- A. Install TPO roofing system according to all current application requirements in addition to those listed in this section.
- B. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.4 INSULATION - GENERAL

- A. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.
- B. Do not install wet, damaged or warped insulation boards.
- C. For new construction over a metal deck or tear off down to a metal deck, install insulation boards so that all edges are supported by the high flutes of the decking with no more than 1/4" gap between adjoining boards. With the manufacturer's Attachment System, the first (or only layer) of insulation does not need to be staggered. Butt the insulation, overlay/recover boards tightly together with no more than a 1/4" gap between boards. If installing multiple layers of insulation, the boards should

be staggered a min of 6”.

- D. Overlay/recover boards may be installed using all full-size overlay boards in a non-staggered manner. These overlay/recover include 5/8” gypsum (Dens Deck and Securock) cover board, approved by TPO manufacturer and meeting engineer’s wind load requirements.
- E. When installing the manufacturer’s Attachment System over tapered insulation, it is critical the roofing manufacturer’s plates are flat and flush against the insulation surface to ensure proper welding of the plate to the membrane. For this reason, it is preferable to install the tapered insulation first and cover the tapered system with an overlay/recover board.
- F. Do not install any more insulation than will be completely waterproofed each day.
- G. Do not align seams with rows of plates, as the step-down that is created will cause an incomplete weld of the roofing plate.
- H. Do not straddle plates over insulation joints, as the gaps will create an incomplete weld of the TPO plate.
- I. Use the appropriate length and type of Drill-Tec™ Fastener for the structural deck. See the roofing manufacturer’s Attachment Table.
- J. The roofing manufacturer shall provide pull testing once installation is complete and provide results in a written letter with pictures. Notify architect for attendance.
- K. Weld plates are different in type and color. TPO plates are a yellow/green, while the PVC plates are black in color. The appropriate plate must be used with the appropriate membranes.
- L. Mechanical attachment for the three distinct areas or zones of a roof
 1. Roof areas have three distinct areas or zones. They are corners (either inside or outside), roof perimeter, and the field of the roof. Each of these areas have their own attachment rates.
 2. These zones or areas have to be determined before the insulation, cover or overlay board’s fasteners are installed. A building’s perimeter edges and corner areas or zones are determined by the height and width and other conditions referenced by ASCE 7 and FM 1-29.
- M. Securing the EverGuard RhinoBond® Plate and Fastener (Basis of design by GAF).
 1. Insulation, overlay/recover boards are to be mechanically attached to the structural deck in accordance with the RhinoBond® Attachment Table
 2. Install the proper number of fasteners per insulation overlay/recover board per roof zone or area.
 3. Fasten to the substrate in an appropriate grid pattern as established by the RhinoBond® Attachment Table. Using chalk lines to make the grids on the substrate is the easiest way to make sure the grid is consistent and plates are easy to find.
 4. Fasteners must be tight enough that the EverGuard® RhinoBond® Plate does not turn or rock.
 5. Over-driven fasteners that distort the face or top of the plate must be removed and discarded. A new EverGuard® RhinoBond® Plate and Fastener must be reinstalled next to the original, but not into the same space and hole.
 6. Under driven or “high fasteners” must be re-driven to proper depth.
 7. When installation of RhinoBond® Plates and Fasteners are complete, the area should be blown or broomed clean to remove any dirt or debris from the substrate surface or contaminates from the

plate's bonding surface. This is critical so as not to puncture the membrane from beneath or to impair the welding of the membrane to the EverGuard® RhinoBond® Plate.

3.5 INDUCTION WELDING OF THE EVERGUARD® MEMBRANE (RhinoBond) (Basis of Design by GAF).

A. Equipment

1. RhinoBond® Portable Bonding Machine (a minimum of two machines is recommended per project).
2. Minimum 5000-watt, continuous generator per two RhinoBond® Portable Bonding Machines.
3. 100' max length, #12 minimum gauge electrical cords.
4. 6 cooling clamps (stand-up magnets that put pressure on the newly welded plate)
5. Pliers
6. Heavy duty plunger
7. Lumber Crayon

B. Equipment Settings

1. IMPORTANT: As with any electrical tool, it is imperative that the tool receive the recommended amount of current for its proper operation. Damage could result from overload (surge) as well as a low voltage situation. No other electrical devices shall be run at the same time as the RhinoBond® Portable Bonding Machines.
2. The RhinoBond® tool must be adjusted to achieve the maximum bond strength with most roofing membranes between 0° and 120° F.

C. Calibration of the machine

1. The user must adjust the RhinoBond® tool to achieve maximum bond strength with EverGuard® roofing membranes from 0° to 120° F ambient temperatures. The tool leaves the factory set to deliver an optimal weld with most membranes at 70°F when set to an energy level of "0". The energy level must be adjusted up (+1, +2, etc.) when temperatures are below 70°F, and down (-1, -2 etc.) when temperatures are above 70°F. These adjustments can be made by using the up/down arrow keys next to the display window on the machine.
2. In an area adjacent to the day's work, lay out 5 EverGuard® RhinoBond® Plates 10" apart and cover them with a fresh piece of field membrane approximately 18" x 5'.
3. Locate the plates under the membrane by dragging your foot across the surface of the membrane. After locating the RhinoBond® Plate, center the machine's red location circle directly over the plate.
4. Determine an initial setting based on the ambient temperature. Remember that 70°F is a "0" energy setting on the display. On a 110° F day in Phoenix, AZ your initial energy setting may be "2" or "3".
5. Weld the first plate at your initial energy setting and immediately place the cooling clamp onto the plate and mark the setting with the lumber crayon. Increase the energy setting using the "up" arrow on the machine by a unit of 1. Weld the second plate to the right of the first plate; mark the setting in crayon and put the second cooling clamp on the plate. Increase by another unit of 1 and weld the third plate. Repeat this process for the next two plates – installing them to the left of your first weld – except *reduce* the energy setting by a unit of 1 from your original setting each time. From left to right, your set of plates will be marked as follows (on a 70 degree F day): -2, -1, 0, 1, 2.
6. Let the membrane over the plates cool to ambient temperature and fold the membrane over exposing the RhinoBond® Plates. Standing on the membrane, use your pliers to grip the plate and pull the plate from the test material, delaminating the plate from the membrane in the process.
7. Three distinct types of bonds are probable, and are as follows: Full bond, an even and consistent weld of the membrane to the plate. The plate will also leave an impression in the membrane.

This is a spec installation. Uneven/incomplete weld of the plate to the membrane. Cause of failure may be energy source set too low, machine not centered over the plate completely, or the plate may be over-driven. This would be a complete or partial hit of the plate. Remember, a full concentration of heat applied to the plate is needed to achieve a spec weld.

- D. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
- E. Full-width rolls shall be installed in the field and perimeter regions of the roof.
- F. Overlap full roof membrane sheets a minimum of 3" for side and end laps.
- G. Install membrane so that the lap runs across the roof slope and lapped toward the drainage points if possible.
- H. All exposed sheet corners shall be rounded a minimum of 1".
- I. All cut edges of reinforced TPO membrane must be sealed with EverGuard® TPO Cut Edge Sealant.
- J. Weld TPO to RhinoBond® Plates with RhinoBond® Portable Bonding Tool. Weighted cooling magnets are placed over the bonded membrane/plates for a minimum of 45 seconds.

3.06 FLASHINGS

- A. All penetrations must be at least 24" (61 cm) from curbs, walls, and edges to provide adequate space for proper flashing.
- B. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
- C. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
- D. Hot-air weld all flashing membranes, accessories, and coated metal. A minimum 2" wide (hand welder) weld or minimum 1 - 1/2" automatic machine weld is required.
- E. Non-coated metal edge details must be installed in accordance with current roofing manufacturer construction details and requirements.
- F. All twenty (20) year roofing systems require the use of coated metal edges where applicable. Bonding adhesive and/or cover tape is not acceptable.
- G. All cut edges of reinforced membrane must be sealed with roofing manufacturer TPO Cut Edge Sealant.

3.7 TRAFFIC PROTECTION

- A. Install walkway pads/rolls at all roof access locations and other designated locations including roof-mounted equipment work locations and areas of repeated rooftop traffic.

- B. Walkway pads must be spaced 2" apart to allow for drainage between the pads.
- C. Fully adhere walkway pads/rolls to the roof membrane with solvent-based bonding adhesive, applied at the rate of 1 gal. per 100 sq. ft. to both the walkway and roof membrane surfaces. Press walkway in position once adhesive is tacky to the touch.
- D. Alternatively, walkway pads/rolls may be hot-air-welded to the roof membrane surface continuously around the perimeter of the pad/roll.

3.8 ROOF PROTECTION

- A. Protect all partially and fully completed roofing work from other trades until completion.
- B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
- C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
- D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.9 FIELD QUALITY CONTROL

- A. Check the quality of plate welds with a heavy-duty plunger. Set the plunger beside the plate and pull up to see if the weld holds the plate. Cut a small slit in the plunger head to remove the vacuum pressure.

3.10 CLEAN-UP

- A. All work areas are to be kept clean, clear and free of debris at all times.
- B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
- D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
- E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
- F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION 07 54 23

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Formed metal wall panel specification section.
- C. Standing Seam metal roof panels specification section

1.2 SUMMARY

- A. Section Includes:
 - 1. **Manufactured through-wall flashing with counterflashing.**
 - 2. **Manufactured reglets with counterflashing.**
 - 3. **Formed roof-Parapet copings and scuppers.**
 - 4. **Formed Downspouts.**
 - 5. **Formed steep-slope roof sheet metal fabrications.**
 - 6. **Formed equipment support flashing.**
 - 7. **Formed overhead-piping safety pans.**
- B. Related Requirements:
 - 1. **Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.**
 - 2. **Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.**
 - 3. **Standing Seam Roofing**
 - 4. **TPO Roofing**

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. **Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.**
 - 2. **Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.**
 - 3. **Review requirements for insurance and certificates if applicable.**

4. **Review sheet metal flashing observation and repair procedures after flashing installation.**

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. **Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.**
- B. Shop Drawings: For sheet metal flashing and trim.
 1. **Include plans, elevations, sections, and attachment details.**
 2. **Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.**
 3. **Include identification of material, thickness, weight, and finish for each item and location in Project.**
 4. **Include details for forming, including profiles, shapes, seams, and dimensions.**
 5. **Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.**
 6. **Include details of termination points and assemblies.**
 7. **Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.**
 8. **Include details of roof-penetration flashing.**
 9. **Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.**
 10. **Include details of special conditions.**
 11. **Include details of connections to adjoining work.**
 12. **Written letter from TPO Roofing manufacturer with acceptance of parapet cap details and scupper details.**
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
 1. **Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.**
 2. **Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.**
 3. **Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.**
 4. **Anodized Aluminum Samples: Samples to show full range to be expected for each color required.**

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. **Build mockup of typical roof Coping ,downspout, including fascia fascia trim apron flashing, approximately 4 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.**
 2. **Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.**
 3. **Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.**
 4. **See masonry specification section for wall mockup. Copings should be applied to that mockup.**
 5. **Provide drawings showing coping joints and expansion joints. Full lengths of sheet metal, not less than 12' shall be used.**

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. **Exposed Panel Finish: Deterioration includes, but is not limited to, the following:**
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. **Finish Warranty Period: 20 years from date of Substantial Completion. (Provide this warranty in the submittals)**

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-105. Identify materials with name of fabricator and design approved by FM Approvals.
- D. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. **Design Pressure: Per current IBC requirements for Rosedale, LA.**
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. **Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.**

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, **G90** coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. **Surface: Smooth, flat.**
 - 2. **Exposed Coil-Coated Finish:**
 - a. Kynar 500 or Hypamar 5000 Floropolymer factory finish (**match metal panel color**) coating with top side dry film thickness of 0.70 to 0.80 mil over .20 - .30 mil prime coat to provide a total topside dry file thickness of 1.0 plus or minus .10 mi. Reverse side shall be coated with primer and wash coat of .30 mi. plus or minus 0.05 mil.
 - 3. **Color: As selected by Architect from manufacturer's full range. (Metallic Colors not required).**
 - 4. **Thickness of base metal: (24 gauge)**
 - 5. **Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.**

2.3 UNDERLAYMENT MATERIALS (Beneath copings)

- A. Self-Adhering, High-Temperature Sheet: Minimum **40 mils** thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
 - c. Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
 - d. Polyguard Products, Inc.; Deck Guard HT.
 - e. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
 2. **Thermal Stability:** ASTM D 1970; stable after testing at **240 deg F** or higher.
 3. **Low-Temperature Flexibility:** ASTM D 1970; passes after testing at minus **20 deg F** or lower.
- B. Slip Sheet: Rosin-sized building paper, **3 lb/100 sq. ft.** minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. **General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.**
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. **Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.**
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape **1/2 inch** wide and **1/8 inch** thick.

- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at **3-inch** intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with interlocking counterflashing on exterior face, of same metal as flashing.
 - 1. **Stainless Steel: 0.016 inch thick.**
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Cheney Flashing Company; Cheney Flashing Sawtooth.
 - 2) Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - 3) Keystone Flashing Company, Inc.; Keystone Three-Way Interlocking Thruwall Flashing.
 - 4) Sandell Manufacturing; Pre-Formed Metal Flashing.
- B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 1. **Manufacturers: Subject to compliance with requirements, provide products by one of the following:**
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products, Inc.
 - d. Hohmann & Barnard, Inc.
 - e. Keystone Flashing Company, Inc.
 - 2. **Material: Stainless steel, 0.019 inch thick.**
 - 3. **Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.**
 - 4. **Metal Panel Type: Provide fasteners approved by metal panel manufacturer.**

5. **Concrete Type:** Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. **Masonry Type:** Provide with offset top flange for embedment in masonry mortar joint.
7. **Accessories:**
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
8. **Finish:** Mill With manufacturer's standard color coating.

2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 1. **Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.**
 2. **Obtain field measurements for accurate fit before shop fabrication.**
 3. **Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.**
 4. **Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.**
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of **1/4 inch in 20 feet** on slope and location lines indicated on Drawings and within **1/8-inch** offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 1. **Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.**
 2. **Use lapped expansion joints only where indicated on Drawings.**
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- J. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
 - 1. **Fabricated Hanger Style: Fig 1-35A according to SMACNA's "Architectural Sheet Metal Manual."**
 - 2. **Fabricate from the following materials:**
 - a. Factory Finished per article 2.2- Galvanized Steel: 24 gauge thick.
- B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, **4-inch-** wide wall flanges to interior, and base extending **4 inches** beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
 - 1. **Fabricate from the following materials:**
 - a. Factory Finished per article 2.2 - Galvanized Steel: 24 gauge thick.
- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows.
 - 1. **Fabricate from the following materials:**
 - a. Factory Finished per article 2.2 - Galvanized Steel: 24 gauge thickness
- D. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
 - 1. **Fabricate from the following materials:**
 - a. Factory Finished per article 2.2 - Galvanized Steel: 24 gauge thickness

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum **96-inch-** long, but not exceeding **12-foot-** long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
 - 1. **Coping Profile: Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual."**
 - 2. **Joint Style: Butted with expansion space and **6-inch-** wide, exposed cover plate.**
 - 3. **Fabricate from the Following Materials:**
 - a. Factory Finished per article 2.2 - Galvanized Steel: 24 gauge thickness

- B. Roof and Roof-to-Wall Transition Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.

1. **Factory Finished per article 2.2 - Galvanized Steel: 22 gauge thickness**

- C. Roof-Drain Flashing: Fabricate from the following materials:

1. **Copper: 12 oz./sq. ft..**

2. **STEEP-SLOPE ROOF SHEET METAL FABRICATIONS**

- D. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:

1. **Factory Finished per article 2.2 - Galvanized Steel: 22 gauge thickness**

All sheet metal colors shall match surrounding metal wall panels and/or standing seam roofing, as selected by architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. **Verify compliance with requirements for installation tolerances of substrates.**

2. **Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.**

3. **Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.**

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than **2 inches**.

- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than **6 inches** staggered **24 inches** between courses. Overlap side edges not less than **3-1/2 inches**. Roll laps and edges with roller. Cover underlayment within 14 days.

- D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. **Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.**
 2. **Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.**
 3. **Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.**
 4. **Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.**
 5. **Torch cutting of sheet metal flashing and trim is not permitted.**
 6. **Do not use graphite pencils to mark metal surfaces.**
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. **Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.**
 2. **Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.**
- C. Parapet metal coping sheet metal shall have joint covers. Corners of parapet shall have standing seam joints with lead cap over seam (paint lead). Parapet metal coping shall not use joint sealants as the only defense mechanism against weather. **Metal flashing joined with Alsan RS is not allowed!!!**
- D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. **Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.**
 2. **Use lapped expansion joints only where indicated on Drawings.**
- E. Fasteners: Use fastener sizes that penetrate [wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws] [substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance].
- F. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- G. Seal joints as required for watertight construction.
1. **Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.**

2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

- H. Rivets: Rivet joints in stainless steel where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Downspouts: Join sections with **1-1/2-inch** telescoping joints.
- 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.**
 - 2. Provide elbows at base of downspout to direct water away from building.**
 - 3. Connect downspouts to underground drainage system.**
- C. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.
- D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
- 1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.**
 - 2. Loosely lock front edge of scupper with conductor head.**
 - 3. seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.**
- E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of **1 inch** below scupper or gutter discharge.
- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of **4 inches** in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Installation methods must meet roofing manufacturer's standards for installation. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered **3-inch** centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

- D. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
 - 1. **Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.**
 - 2. **Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.**
 - 3. **Alsan RS shall not be used to join coping metal!!! Coping shall be joined by standing seams or concealed metal seam caps, including corners.**
- E. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- F. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- G. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 04 20 00 "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 65 00 - FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
 - 1. Base Flashing at ground face cmu /block and brick veneer walls.
 - 2. Rowlok sills.
 - 3. Head and sill flashing at windows and doors.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
 - 1. Advanced Building Products Inc. – 5 oz. Cop-R-Kraft Flashing
 - 2. AFCO Products, Inc. – 5 oz. Cop-R-Bond

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Begin flexible flashing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Head and sills:
 - 1. A.Flashing shall be inserted in nearest block course above window or door at least 3". Start flashing 1/16" from face of wall and extend down wall over steel lintel or under rowlok sill. Extend flashing at least 6" beyond window head or sill. Extend flashing out beyond face of materials and trim off excess during cleanup.
 - 2. Flashing at dampcourses:
 - 1. A.Flashing shall be inserted in nearest block course above bottom block course at least 3". The material shall be lapped at least 4" and sealed with an asphalt mastic. Turn flashing out to edge of slab.
 - 3.

END OF SECTION 07650

SECTION 07 71 23 - ROOF EDGE DRAINAGE SYSTEMS (GUTTERS AND DOWNSPOUTS)

PART 1 GENERAL

1.1 QUALITY ASSURANCE

- A. Reference Standards
 - 1. As noted for individual items.
 - 2. ASTM Standards.
 - 3. SMACNA Architectural Sheet Metal Manual.

1.2 SUBMITTALS

- A. Shop Drawings:
 - 1. Details.
- B. Samples:
 - 1. For finish, color and color range selection.
- C. Contract closeout information:
 - 1. Warranty, finish.
 - 2. Warranty, installation.

1.3 JOB CONDITIONS

- A. Coordinate work with existing roofing and soffit and fascia installation.
- B. Provide components necessary to create watertight junctures between roofing, soffit and fascia and sheet metal work.

1.4 WARRANTY

- A. Furnish 20 year warranty on clad sheet metal finish.
- B. Furnish 10 year warranty on sheet metal work, signed jointly by Contractor and sheet metal installer.
- C. Agree to repair or replace work which leaks water, deteriorates excessively or otherwise fails to perform as watertight flashing.
- D. Repair finish of clad sheet metal which fades or is damaged.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Acceptable Manufacturer's
 - 1. Sheet Metal, clad:
 - a. Berridge (Basis of Design)
 - b. Pac Clad

- B. Exposed sheet metal:
 - 1. Clad steel, galvanized G90.
 - a. Smooth.
 - b. Minimum 24 GA.
 - 2. ASTM-A653/A653M.
 - 3. Coated on each face with 1 mil fluorocarbon coating, 70 percent Kynar/Hylar.
- C. Concealed sheet metal:
 - 1. Stainless steel, ASTM-A167 or ASTM-A176.
 - 2. Minimum 24 GA, soft annealed.
- D. Fasteners: Same material as sheet metal or non-ferrous fasteners which will not rust, corrode or react.
- E. Retainers: 16 GA galvanized steel or stainless steel.
- F. Solder:
 - 1. ASTM-B32 as applicable to materials joined.
 - a. Stainless steel: 50/50 solder with stainless steel type flux.
 - 2. Neutralize flux after soldering.
- G. Dissimilar metal and cementitious materials protection:
 - 1. Alkali resistant bituminous paint.
 - 2. Tnemec Tneme Tar 46-413.
 - 3. Approved equal.
- H. Sealants: See Section 079000.

2.2 FABRICATION-SHEET METAL

- A. Fabricate true and sharp to profiles and sizes indicated.
- B. Shop fabricate items to maximum extent possible.

PART 3 EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Verify suitability of substrates to accept work.
 - 1. Verify continuous wood blocking sloped 1:12 and covered with one layer of building paper.
- B. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION-SHEET METAL

- A. Provide items to be built into other construction to Contractor in time to allow their installation.
- B. If such items are not provided in time for installation, sheet metal fabricator cut in and install.

- C. Fabricate and install in accordance with details and recommendations of SMACNA.
 - a. Provide clad sheet metal assemblies where exposed.
 - b. Provide stainless steel flashing where concealed.
- D. Set shop fabricated clad sheet metal interior and exterior preformed corners and intersections.
- E. Set shop fabricated and welded stainless steel interior and exterior preformed corners and intersections.
 - a. Do not joint at corners.
 - b. Furnish factory formed corners.
- F. Solder stainless steel flashing to achieve weathertight joints and required details; do not solder slip joints.
- G. Fasten materials at recommended intervals.
- H. Provide slip joints to allow for thermal movement.
 - a. Provide slip joint in conjunction with splices and corners.
- I. Caulk joints with 2 beads of sealant on each overlap: See Section 079000.
- J. Turn down cap flashing over base flashings 4 inches and caulk.
- K. Form flashings to provide spring action with exposed edges hemmed or folded to create tight junctures.
- L. Provide dissimilar metals and materials protection where dissimilar metals come in contact, or where sheet metal contacts mortar or concrete.
- M. Provide miscellaneous sheet metal items not specifically covered elsewhere, as indicated or required to provide a weathertight installation.
- N. Provide continuous retainers.
- O. Gutters will have uniform sections of 10' or 18'.
- P. Downspouts shall be rectangular 5"x5" with concrete splash blocks at each location.
- Q. Splash blocks shall be concrete, minimum 12"x12", set flush with grade and pitched minimum 1/2" per foot away from building.
- R. End caps for gutters shall have a factory installed watertight EPDM seal and attach using friction.
- S. All downspouts and elbows shall be seamed.
- T. Install gutter hangers using two 1.25" screw shank nails and fastened into solid lumber.
- U. All gutters shall be in continuous length for each elevation (run). No end laps are allowed.
- V. Provide gutter supports at as many existing locations as possible.

W. No dissimilar metals shall be in contact, which shall cause galvanic action.

3.3 CLEANING

- A. Upon completion of work, repair damaged areas.
- B. Clean stains and debris.
- C. Remove protective coverings.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof hatches, see plans for locations and quantity.
- B. Related Sections:
 - 1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
 - 3. SBS Roofing

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.8 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Aluminum Sheet: **ASTM B 209**, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
1. Mill Finish: As manufactured.
- B. Aluminum Extrusions and Tubes: **ASTM B 221**, manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWWA C2; not less than 1-1/2 inches thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Underlayment:
 - 1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 2. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
 - 3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
 - 4. Underlayments may vary according to roofing manufacturer's approved underlayments.
- F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
 - 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric [polyurethane] [silicone] polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. Bilco Company (The).
 - c. Custom Solution Roof and Metal Products.
 - d. J. L. Industries, Inc.
 - e. Metallic Products Corp.
- B. Type and Size: Single-leaf lid,.
- C. Size 30w x 42" long.
- D. Loads: Minimum 40-lbf/sq. ft. external live load and 30-lbf/sq. ft. internal uplift load.
- E. Hatch Material: Aluminum sheet, 0.090 inch thick.
 1. Finish: Mill.
- F. Construction:
 1. Insulation: Polyisocyanurate board.
 2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 4. Fabricate curbs to minimum height of 10 inches above sbs roof unless otherwise indicated.
- G. Hardware: Galvanized-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
 1. Provide two-point latch on lids larger than 84 inches.
- H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
 1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
 2. Height: 42 inches above finished roof deck membrane.
 3. Material: Steel tube.
 4. Post: 1-5/8-inch- diameter pipe.
 5. Finish: Manufacturer's standard baked enamel or powder coat.
 - a. Color: As indicated by manufacturer's designations As selected by Architect from manufacturer's full range.
 - b.
- I. Protection Railings.

1. Protections railings will be required for any roof hatches located 10'-0" or closer to a roofing edge or any other governing factors issued by OSHA. Provide a railing system meeting OSHA regulation.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Roof-Hatch Installation:
 - 1. Install roof hatch so top surface of hatch curb is level.
 - 2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 3. Attach safety railing system to roof-hatch curb.
 - 4. Attach ladder-assist post according to manufacturer's written instructions.
- F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.
- B. Related Sections:
 - 1. Gypsum Board

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A/D Fire Protection Systems Inc.
 - b. CEMCO.
 - c. Fire Trak Corp.
 - d. Grace Construction Products.
 - e. Hilti, Inc.
 - f. Johns Manville.
 - g. Nelson Firestop Products.
 - h. NUCO Inc.
 - i. Passive Fire Protection Partners.
 - j. RectorSeal Corporation.
 - k. Specified Technologies Inc.
 - l. 3M Fire Protection Products.
 - m. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - n. USG Corporation.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide fire-resistive joint systems with rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg or ASTM E 2307.
 - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A/D Fire Protection Systems Inc.
 - b. Grace Construction Products.
 - c. Hilti, Inc.
 - d. Johns Manville.
 - e. Nelson Firestop Products.
 - f. NUCO Inc.
 - g. Passive Fire Protection Partners.
 - h. RectorSeal Corporation.

- i. [Specified Technologies Inc.](#)
 - j. [3M Fire Protection Products.](#)
 - k. [Thermafiber, Inc.](#)
 - l. [Tremco, Inc.; Tremco Fire Protection Systems Group.](#)
 - m. [USG Corporation.](#)
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Urethane joint sealants.
 - 2. Polysulfide joint sealants.
 - 3. Latex joint sealants.
 - 4. Solvent-release-curing joint sealants.
 - 5. Preformed joint sealants.
 - 6. Acoustical joint sealants.
- B. Related Sections:
 - 1. Section 042000 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
 - 2. Section 078446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
 - 3. Section 088000 "Glazing" for glazing sealants.
 - 4. Section 092900 "Gypsum Board" for sealing perimeter joints and acoustical sealants.
 - 5. UL Design U 419

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- B. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion Test Reports: For each sealant application tested.
- G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- E. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[or are below 40 deg F (5 deg C)].
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 2 years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

- C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS @ BUILDING CONTROL JONTS

- A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolastic NP1.
 - b. Sika Corporation, Construction Products Division; Sikaflex – 15 LM.
 - c. Tremco Incorporated; Vulkem 116.

2.3 ACOUSTICAL JOINT SEALANTS @ BASE OF ALL DRYWALL

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

- B. Provide Sealant at smoke walls, see also fire resistive joint systems.

2.4 JOINT SEALANT BACKING

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

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining

after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than **3/8 inch (10 mm)**. Hold edge of sealant bead **1/4 inch (6 mm)** inside masking tape.
 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.
- 3.4 FIELD QUALITY CONTROL
- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Inspect tested joints and report on the following:

- a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 2. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 3. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION 079200

SECTION 07 95 00 – EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Types of joints for which architectural joint systems are specified include the following:
 - 1. Interior wall, ceiling and floor joints.
 - 2. Exterior wall, ceiling and floor joints.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for block-outs and cast-in anchorage and frames for architectural joint systems in concrete floors, parking decks, and walls.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal roof and wall joint systems.
 - 3. Division 7 Section "Roof Expansion Assemblies" for factory-fabricated roof joint systems.
 - 4. Division 7 Section "Joint Sealants" for elastomeric sealants and preformed compressed-foam sealants without metal frames.

1.3 DEFINITIONS

- A. Architectural Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.
- B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.
- D. Maximum Joint Width: Widest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- E. Minimum Joint Width: Narrowest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- F. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage of nominal value of joint width.

- G. Nominal Joint Width: Width of linear gap indicated as representing the conditions existing when architectural joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide factory-fabricated architectural joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
1. Joints in Fire-Resistance-Rated Assemblies: Maintain fire-resistance ratings of adjacent assemblies.
 2. Joints in Smoke Barriers: Maintain integrity of smoke barrier.
 3. Joints in Acoustically Rated Assemblies: Inhibit passage of airborne noise.
 4. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
 5. Joints in Surfaces with Architectural Finishes: Serve as finished architectural joint closures.

1.5 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.
- B. Shop Drawings: For each joint system specified, provide the following:
1. Placement Drawings: Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each exposed metal and elastomeric material of joint system indicated.
1. Include similar Samples of material for joints and accessories involving color selection.
- D. Samples for Verification: Full-size units 6 inches long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
- E. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.

- F. Research/Evaluation Reports: Evidence of architectural joint system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.
- B. Fire-Test-Response Characteristics: Where indicated, provide joint systems incorporating fire barriers that are identical to those of assemblies tested for fire resistance per ASTM E 119 including hose-stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Other manufacturers' systems complying with requirements may be considered. Refer to Division 1 Section "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for each architectural joint system specified in Part 2 "Architectural Joint Systems" Article below is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers listed.

2.2 MATERIALS

- A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Preformed Seals: Single or multicellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles. Formed to be installed in frames or with anchored flanges, in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint.

- D. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 ARCHITECTURAL JOINT SYSTEMS

- A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces.
1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
 2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
 3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.
 4. Public Arena Seals: Non-slip seals designed for installation on treads and risers and to lie flat with adjacent surfaces, and complying with ADA guidelines for public areas.
- B. Architectural Joint System: Metal frames with preformed seals for interior joints on walls, ceilings and floors.
1. Basis-of-Design Product: Construction Specialties Inc. Series 100 or a comparable product of one of the following:
 - a. Architectural Art Mfg., Inc.
 - b. InPro Corporation
 - c. MM Systems Corporation
 2. Basis-of-Design Components:
 - a. FCF-100
 - b. FUFC-100
 - c. FWFC-100
 - d. GFSTW-100
 - e. GFST-100
 3. Maximum Joint Width: 1"
 4. Type of Movement Capability: Expansion and contraction.
 5. Cyclic-Movement-Test-Response Characteristics: No evidence of visual fatigue, inability to cycle between designated joint widths, or other types of failure as

determined by testing products identical to those indicated per ASTM E 1399 including Appendix X3.

6. Preformed Seal Material: Manufacturer's standard.

- a. Seal Color: Gray.

7. Exposed Frame Material: Aluminum.
8. Moisture Barrier: Provide manufacturer's standard unit.
9. Fire-Resistance Ratings: Provide manufacturer's standard fire barrier with a rating not less than that of adjacent construction.

- C. Architectural Joint System: Metal frames with preformed seals for floor to floor separation.

1. Basis-of-Design Product: Emseal Joint System Ltd., Migutan FP 110/25 (with Stainless Steel cover plate) or a comparable product of one of the following:

- a. Architectural Art Mfg., Inc.

- b. InPro Corporation

- c. MM Systems Corporation

2. Maximum Joint Width: 2"
 3. Type of Movement Capability: Expansion and contraction.
 4. Cyclic-Movement-Test-Response Characteristics: No evidence of visual fatigue, inability to cycle between designated joint widths, or other types of failure as determined by testing products identical to those indicated per ASTM E 1399 including Appendix X3.
 5. Preformed Seal Material: Manufacturer's standard.
 - a. Seal Color: Gray.
 6. Exposed Frame Material: Stainless Steel.
 7. Moisture Barrier: Provide manufacturer's standard unit.
 8. Fire-Resistance Ratings: Provide manufacturer's standard fire barrier with a rating not less than that of adjacent construction.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

- B. Mill Finish: AA-M10 (Mechanical Finish: as fabricated; no other applied finish unless buffing is required to remove scratches, welding, or grinding produced in fabrication process.

2.6 STAINLESS STEEL FINISH

- A. ASTM A167, Type 304 with 2B finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing architectural joint assemblies and materials, unless more stringent requirements are indicated.
- B. Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
- C. Terminate exposed ends of exterior architectural joint assemblies with factory-fabricated termination devices to maintain waterproof system.
- D. Install factory-fabricated transitions between building expansion-joint cover assemblies and roof expansion-joint assemblies, specified in Division 7 Section "Roof Expansion Assemblies," to provide continuous, uninterrupted, watertight construction.
- E. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.
 - 1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.

3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
 4. Locate wall, ceiling and floor covers in continuous contact with adjacent surfaces.
 5. Securely attach in place with required accessories.
 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- F. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- G. Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.
1. For straight sections, provide preformed seals in continuous lengths.
 2. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.
 3. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.
 4. Seal transitions according to manufacturer's written instructions.
 5. Install foam seals with adhesive recommended by manufacturer and heat seal all splices.
- H. Joint Systems with Seals: Seal end joints within continuous runs and joints at transitions according to manufacturer's written instructions to provide a watertight installation.
- I. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and end joints.

3.3 CLEANING AND PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

END OF SECTION 07 95 00

DIVISION 08
OPENINGS

SECTION 08 45 23 - FIBERGLASS SANDWICH PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
 - 1. Flat insulated, translucent sandwich panels
 - 2. Aluminum clampite installation system
 - 3. Aluminum flashing attached to skylights

1.2 SUBMITTALS

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles, and finishes of components.
- B. Submit shop drawings. Include plans, elevations, and details.
- C. Submit manufacturer's color charts showing the full range of colors available for factory finished exposed aluminum.
 - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
 - a. Sandwich panels: 7" x 12" units
 - b. Factory finished aluminum: 3" long sections
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
 - 1. Reports required (if applicable) are:
 - a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
 - b. Burn Extent (ASTM D 635)
 - c. Color Difference (ASTM D 2244)
 - d. Impact Strength (UL 972)
 - e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
 - f. Bond Shear Strength (ASTM D 1002)
 - g. Beam Bending Strength (ASTM E 72)
 - h. Insulation U-Factor (NFRC 100)
 - i. NFRC System U-Factor Certification (NFRC 700)
 - j. NFRC Visible Light Transmittance (NFRC 202)
 - k. Solar Heat Gain Coefficient (NFRC or Calculations)
 - l. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)

- m. Air Leakage (ASTM E 283)
- n. Structural Performance (ASTM E 330)
- o. Water Penetration (ASTM E 331)
- p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (ASTM E2707)
- q. Fall Through Resistance (ASTM E 661)
- r. Class A Roof Covering Burning Brand (UL 790)
- s. UL Listed Class A Roof System (UL 790) (Optional) – Submit UL Card

1.3 CLOSEOUT SUBMITTALS

- A. Provide field maintenance manual to include in project maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:

- 1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
- 2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
- 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing manufacturer's panel systems for at least (2) two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

1.5 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
 - 1. When requested, include span analysis data.
 - 2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
 - 3. Structural Loads. Provide skylight system capable of handling wind loads calculated for the project specific location.
 - a. Live Load: 20 psf
 - b. Wind Load: See drawings for wind diagram.

B. Deflection Limits:

1. Unit Skylight: Limited to **L/120** of clear span for each assembly component.

C. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.7 WARRANTY

- A. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails in material or workmanship. Warranty period starts from date of substantial completion. Failure of material or workmanship shall include deterioration of finish on metal in excess of normal weathering; and defects in accessories; insulated, translucent sandwich panels; and other components of the work.
- B. Material Workmanship: Provide manufacturer's standard 5 year
- C. Panel Warranty (including color change): Provide manufacturer's standard 10 year
- D. Finish Warranty: Provide manufacturer's standard 10 year

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: "S-Line Translucent Skylight System" by Kalwall Corporation; Contact: Don Bufkin, Tel: 601-927-9670 Email: don@bufkinbuildingspecialties.com
- B. Approved Equal: "Light Basic Translucent Skylight System" by Major Industries Inc.; Tel: 888-759-2678; info@majorskylights.com

2.2 PANEL COMPONENTS

A. Face Sheets:

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
 - b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
2. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 450 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1”.
3. Exterior face sheets:
 - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
 - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of **70 ft. lbs** without fracture or tear when impacted by a 3-1/4” diameter, 5 lb. free-falling ball per UL 972.
 - c. Erosion Protection: Integral, embedded-glass erosion barrier.
4. Appearance:
 - a. Exterior face sheet: Smooth, Standard .070” thick and Crystal Type A in color.
 - b. Interior face sheet: Smooth, Standard .045” thick and White in color.
 - c. Face sheets shall not vary more than $\pm 10\%$ in thickness and be uniform in color.

B. Grid Core:

1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16”.

C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council “Acceptance Criteria for Sandwich Panel Adhesives”.
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a. 50% Relative Humidity at 68° F: 540 PSI
 - b. 182° F: 100 PSI
 - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
1. Thickness: **2-3/4 inches**
 2. Grid Core Insulation: Fill panel cores with **fiberglass batt**
 3. Panel U-factor by NFRC certified laboratory:
 - a. 2-3/4" aluminum grid **U-factor: 0.20**
 4. Complete insulated panel system shall have certified **NFRC U-factor: 0.36**
 5. Visible Light Transmittance (VLT):
 - a. Visible LT (NFRC 202) by NFRC certified laboratory: **26 % Crystal/White**
 6. Solar heat gain coefficient **0.30**
 7. Grid pattern as viewed: Nominal size 12 inch x 24 inch ; pattern Shoji
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
- C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:
1. Absence of flame penetration through the wall assembly at any time.
 2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-min observation period.
 3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-min observation period.
- D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.
- E. Skylight System:
1. Skylight system shall pass Class A Roof Burning Brand Test by UL 790.
- F. Skylight System shall meet the fall through requirements of OSHA 1910.21 as demonstrated by testing in accordance with ASTM E 661, thereby not requiring supplemental screens or railings.

2.4 ALUMINUM CLAMPTITE INSTALLATION SYSTEM

- A. Aluminum clamp-tite installation system - Unit Skylight:
1. Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
 2. Skyroof perimeter aluminum clamp-tite installation system at curbs shall be factory sealed to panels.
- B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamp-tite installation system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum clamp-tite installation system, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure, and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Metal Protection:
 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
 2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

3.3 INSTALLATION

- A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.
 1. Anchor component parts securely in place by permanent mechanical attachment system.
 2. Accommodate thermal and mechanical movements.
 3. Seal aluminum clamtite installation system as shown on the manufacturer's fabrication drawings and suggested installation instructions.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturers fabrication drawings and suggested installation instructions.

3.4 FIELD QUALITY CONTROL (Skyroof/Unit Skylight/Walls/Fixed Window Units)

- A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.5 CLEANING

- A. Clean the panel system, interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION 08 45 23

SECTION 08 80 00 – GLAZING GASKETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazing gaskets for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Aluminum Storefront
 - 2. Aluminum Curtain Walls

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.

3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For each type of glazing gasket product; 12 inches (300 mm) long.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass glazing sealants and glazing gaskets.
 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain insulating glass and single pane glass in storefront doors from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- I. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 WARRANTY

- A. Manufacturer's Special Warranty for glazing gaskets: Manufacturer's standard form in which manufacturer agrees to replace gaskets that deteriorate within specified warranty period. Deterioration of is defined as defects developed from normal use that are not attributed to maintaining and cleaning contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness to match existing and as required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C 864.
 - 2. EPDM complying with ASTM C 864.
 - 3. Silicone complying with ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness to match existing and required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.2 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. May National Associates, Inc.; Bondaflex Sil 290.
 - d. Pecora Corporation; 890.
 - e. Sika Corporation, Construction Products Division; SikaSil-C990.
 - f. Tremco Incorporated; Spectrem 1.

2.3 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

DIVISION 08
OPENINGS

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

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

- B. Related Sections:

- 1. Division 01 Section "General Conditions".
 - 2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 3. Division 08 Section "Flush Wood Doors".
 - 4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
 - 5. Division 08 Section "Door Hardware".
 - 6. Division 08 Section "Access Control Hardware".
 - 7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

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

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
 - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
 - 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. 10. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.
10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
11. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
12. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
13. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
14. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
15. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
16. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
17. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
18. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
19. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 MATERIALS

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

- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

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

6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. CECO Door Products (C) Polystyrene Core - Legion Series.

2.4 HOLLOW METAL FRAMES

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

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

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

- a. CECO Door Products (C) - SU SR Series.

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

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

- a. CECO Door Products (C) - SU Series.

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

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

2.5 FRAME ANCHORS

- A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
 - 1. Blade Type: Vision proof inverted V or inverted Y.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

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

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 - 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 - 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 - 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.

7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
 11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

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

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with

approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. **Solid-core doors with wood-veneer faces.**
 - 2. **Factory pre-finished & fitting flush wood doors to frames and factory machining for hardware.**
- B. Related Requirements:
 - 1. **Section 08 11 13 Hollow metal doors and frames.**
 - 2. **Section 08 71 00 Door Hardware.**

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. **Dimensions and locations of blocking.**
 - 2. **Dimensions and locations of mortises and holes for hardware.**
 - 3. **Dimensions and locations of cutouts.**
 - 4. **Undercuts.**
 - 5. **Requirements for veneer matching.**
 - 6. **Doors to be factory finished and finish requirements.**
 - 7. **Fire-protection ratings for fire-rated doors.**
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
 - 1. **Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.**
 - 2. **Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with**

INFORMATIONAL SUBMITTALS

- E. Sample Warranty: For special warranty.
- F. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.8 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. **Failures include, but are not limited to, the following:**
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. **Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.**
 - 3. **Warranty Period for Solid-Core Interior Doors: Life of installation.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. **Masonite Architectural (Marshfield-Algoma).**
2. **Eggers Industries.**
3. **Graham Wood Doors; an Assa Abloy Group company.**
4. **Ipik Door Company.**
5. **Oshkosh Door Company.**

- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
1. **Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.**
 2. **Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.**
- B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site.
- C. WDMA I.S.1-A Performance Grade: Heavy Duty.
- D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. **Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.**
 2. **Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.**
 3. **Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.**
 4. **Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.**
 5. **Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.**
 6. **Pairs: Provide formed-steel edges and astragals with intumescent seals.**
 - a. Finish steel edges and astragals to match door hardware (locksets or exit devices).
- E. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- F. Particleboard-Core Doors:
1. **Particleboard: ANSI A208.1, Grade LD-2.**
 2. **Blocking: Provide wood blocking in particleboard-core doors as follows:**
 - a. 5-inch midrail blocking, in doors indicated to have exit devices.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. **Approved factor finish stain shall be:**
 - a. Basis of design: Masonite Architectural (Marshfield-Algoma) Aspiro Series
 - b. Factory stain color shall be determined from all available colors within the manufacturers range for the series listed.
2. **Provide factory finish with UV Coating.**
3. **Grade: Premium, with Grade A faces.**
4. **Species: Select white birch.**
5. **Cut: Plain Sliced**
6. **Match between Veneer Leaves: Pleasing match.**
7. **Assembly of Veneer Leaves on Door Faces: Balance match.**
8. **Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.**
9. **Exposed Vertical Edges: Same species as faces - edge Type A.**
10. **Core: Particleboard.**
11. **Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.**
12. **WDMA I.S.1-A Performance Grade: Heavy Duty.**
13. **Seal and stain tops and bottoms of all doors.**
14. **Any doors with scratches will be rejected. Stain "touch ups" not allowed in field.**

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. **Wood Species: Same species as door faces.**
2. **Profile: Lipped tapered beads.**
3. **At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.**
4. **Wood trim around lights shall have tightly fitted mitered corners. Brad nails shall be countersunk, and wood filler applied. No exposed nail holes permitted!**

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

C. Metal Louvers:

1. **Manufacturers: Subject to compliance with requirements, provide products by one of the following:**
 - a. Air Louvers, Inc.
 - b. Anemostat; a Mestek company.
 - c. L & L Louvers, Inc.
 - d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - e. McGill Architectural Products.
2. **Blade Type: Vision-proof, inverted V.**
3. **Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.**

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. **Comply with NFPA 80 requirements for fire-rated doors.**
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. **Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.**
 - 2. **Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.**
- C. Openings: Factory cut and trim openings through doors.
 - 1. **Light Openings: Trim openings with moldings of material and profile indicated.**
 - 2. **Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."**
 - 3. **Louvers: Factory install louvers in prepared openings.**

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. **Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.**
- B. Factory finish doors.
- C. Transparent Finish:
 - 1. **Grade: Premium.**
 - 2. **Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 10, UV curable, water based or System 11, catalyzed polyurethane.**
 - 3. **Staining: As selected by Architect from manufacturer's full range.**
 - 4. **Effect: Filled finish.**
 - 5. **Sheen: Satin.**

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. **Install fire-rated doors according to NFPA 80.**
 - 2. **Install smoke- and draft-control doors according to NFPA 105.**
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.
 - 2. Floor access doors and frames.
- B. Related Requirements:
 - 1. Section 07 72 00 "Roof Accessories" for roof hatches.
 - 2. Section 23 33 00 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ALLOWANCES

- A. Access doors and frames are part of an access door and frame allowance.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction detail, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method

and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
1. Access Panel Solutions.
 2. Acudor Products, Inc.
 3. Alfab, Inc.
 4. Babcock-Davis.
 5. Cendrex Inc.
 6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
 7. Jensen Industries; Div. of Broan-Nutone, LLC.
 8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 9. Karp Associates, Inc.
 10. Larsen's Manufacturing Company.
 11. Maxam Metal Products Limited.
 12. Metropolitan Door Industries Corp.
 13. MIFAB, Inc.
 14. Milcor Inc.
 15. Nystrom, Inc.
 16. Williams Bros. Corporation of America (The).
- C. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- D. Flush Access Doors with Exposed Flanges
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 2. Locations: Wall and ceiling, as required to access equipment.
 3. Door Size: As indicated on drawings
 4. Uncoated Steel Sheet for Door: Nominal **0.060 inch**, 16 gage
 - a. Finish: Factory finish.
 5. Frame Material: Same material, thickness, and finish as door
 6. Hinges: Manufacturer's standard
 7. Hardware: Latch
- E. Hardware:
1. Latch: Cam latch operated by screwdriver.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

- C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- D. Frame Anchors: Same type as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 2. Provide mounting holes in frame for attachment of masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior and interior aluminum-framed storefronts.
 - a. Glazing is retained mechanically with gaskets on four sides.
 - b. Single pane glass at interior areas.
 - 2. Exterior and interior manual-swing aluminum doors.
- B. Related Sections include the following:
 - 1. Division 7 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
 - 2. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
 - 3. Division 8 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Dimensional tolerances of building frame and other adjacent construction.
 - 4. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units to function properly.

- B. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi.
- C. Structural Loads:
 - 1. Wind Loads: as per structural engineer & 2015 IBC.
- D. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
 - 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. Test High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Test Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Test Interior Ambient-Air Temperature: 75 deg F.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- G. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Water Penetration Under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
 - 1. Maximum Water Leakage: [No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation]. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.
- I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
 - 2. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
 - 1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Exterior Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of profile indicated on drawings
 - a. Framing at exterior windows for 1" insulating glass.(Interior storefront similar, non thermal – ¼" glass)
 - 1) Kawneer 451T (Thermally broken) – BASIS OF DESIGN
 - 2) Vistawall Series 3000 (Thermally broken)
 - 3) YKK (Thermally broken)
 - 4)
2. Interior StoreFront Framing System for ¼" glass
 - a. Kawneer 450 BASIS OF DESIGN
 - b. Vistawall 3000
 - c. YKK

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 1. Sheet and Plate: **ASTM B 209.**
 2. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B 221.**
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308.
- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 1. Structural Shapes, Plates, and Bars: ASTM A 36.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: thermal break.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection Provide HP subsill. Note: Insert a continuous .060 aluminum sub sill under all exterior sill sections. **Turn leg up ¼" on interior and slope 1 ½" on exterior leg to match sill profile.**
- F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.
- G. Backer Plates: Install continuous solid backer plates on all jamb and head members. Plates may be rigid plastic or aluminum.
- H. Provide shop drawings stamped by a Louisiana registered civil engineer verifying the system meets or exceed the wind low criteria noted on the structural plans.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

- A. Doors: Manufacturer's standard glazed doors, for manual swing operation.
 1. Door Construction: 2" inch overall thickness, with minimum 0.125 inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
 2. Door Design: Medium stile, heavy wall; 3-1/2-inch vertical nominal width, 6-1/2" min. sill and head depth.

2.6 DOOR HARDWARE

- A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.

- B. Scheduled Door Hardware: Coordinate with hardware supplier on all items.
 - 1. Products by storefront supplier:
 - a. Integral extruded aluminum thresholds and removable 2" x 4" steel center mullion prepped for lock cylinder at all exterior doors.
 - b. Door weather sweeps.
 - c. Prep doors for cylinders provided by hardware supplier.
 - 2.
 - 3. All other hardware products by hardware supplier: Coordinate with Hardware Supplier.
 - 4. GC SHALL COORDINATE WHICH DISCIPLINE SHALL RUN LOW VOLTAGE WIRING IN STOREFRONT FOR CARD READERS. NO FINGER POINTING DUE TO DOOR SUPPLIER OR ELECTRICIAN NOT PICKING UP THIS WORK.

2.7 ACCESSORY MATERIALS

- A. Insulating Materials: As specified in Division 7 Section "Building Insulation."
- B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.
- D. Note: Provide .060 clear anodized subsills at all exterior storefront. with ½" back lip & turned ends, ea. side with 1.5" exterior exposure. Bed in sealant.

2.8 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from exterior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

- D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device (dutchman) to retain glazing in place while structural sealant cures.
- F. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Doors: Reinforce doors as required for installing hardware.
 - 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- J. Caulk joints around storefront framing will be inspected. If it's not smooth, uniform, and consistent throughout, per the architects observations, the installer will have to remove and start over. An experienced caulker is recommended.

2.9 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Class 1, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611. Color # 17 clear.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, without warp or rack.
- F. Install glazing as specified in Division 8 Section "Glazing."
 - 1. Structural-Sealant Glazing:
 - a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - b. Install weatherseal sealant according to Division 7 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

- G. Entrances: Install to produce smooth operation and tight fit at contact points.
 - 1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
 - 2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.
- I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to **1/8 inch in 12 feet; 1/4 inch** over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to **1/16 inch**.
 - b. Where surfaces meet at corners, limit offset from true alignment to **1/32 inch**.
 - 3. Diagonal Measurements: Limit difference between diagonal measurement to **1/8 inch**.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING

- A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
- B. Conditions and Division 01 Specification Sections, apply to this Section.

END OF SECTION 08 41 13

SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes conventionally glazed aluminum curtain walls, Thermally broken, installed as stick assemblies at gym and lobby.
- B. If structural sealant is used to adhere glazing in small areas of an assembly such as outside edge of glazing at building corners, consider inserting requirements in this Section using Division 8 Section "Structural-Sealant-Glazed Curtain Walls" as a guide.
- C. Related Sections:
 - 1. Division 7 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
 - 2. Division 8 - Aluminum Store Fronts and Entrances
 - 3. Division 9 - Glazing

1.3 ALLOWANCES

- A. Provide field quality-control testing as part of testing and inspecting allowance.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.

- e. Failure of operating units.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads :Reference Structural Drawings
- D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $L/175$ of the glass edge length for each individual glazing lite $1/175$ of clear span for spans up to 13 feet 6 inches and to $1/240$ of clear span plus $1/4$ inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than $1/8$ inch.
- E. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..
- F. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..
 - 1. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.
- G. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. Test Interior Ambient-Air Temperature: 75 deg F.
 - 3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
- H. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.
 - 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 - 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
 - 3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft..

4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than 15 as determined according to NFRC 500.
- I. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:
 1. Outdoor-Indoor Transmission Class: Minimum 30 when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Provide glazed aluminum curtain walls that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified testing agency.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
 - a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.

3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

- F. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- C. Preconstruction Testing Agency Qualifications: Qualified according to ISO/IEC 17025 and accredited by ICC-ES for preconstruction testing indicated.
- D. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- G. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.
- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall area as shown on Drawings.

2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
2. Warranty Period: Five years from date of Substantial Completion.

- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer 1600T series curtainwall - 2 ½" x 7 ½" or comparable product by one of the following:
 - 1. Kawneer North America; an Alcoa company.
 - 2. Tubelite.
 - 3. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
 - 4. YKK

*If the wind load requirements and attachment methods shown in the plans are deemed to require a different frame size by the curtain wall manufacturer's engineering department, that frame size and attachment method shall be provided at no additional cost.

2.2 MATERIALS (framing systems shall have Clear Anodized Aluminum Finish), to match storefront.

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING

- A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally improved .
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.

- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components. Provide U, T, and F anchors as required to anchor framing into structure.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
 - 2. Brackets, Supports, and Angles, attached to structural steel, shall be provided by and installed by the curtain wall manufacturer. The brackets shall match the finish of the curtainwall.
- E. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- F. Framing Sealants: Manufacturer's standard sealants. (See storefront notes for caulking requirements by an experienced caulker).

2.4 GLAZING

- A. Glazing: Comply with Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
 - 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 7. Components curved to indicated radii.
- D. Fabricate components that, when assembled, have the following characteristics:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.
- F. Factory-Assembled Frame Units:
 - 1. Rigidly secure nonmovement joints.
 - 2. Seal joints watertight unless otherwise indicated.
 - 3. Install glazing to comply with requirements in Division 8 Section "Glazing."
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 7. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Division 8 Section "Glazing."

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:

- a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas of glazed aluminum curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.
1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article, but not more than 0.50 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft..
 - a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.
 - b. Perform a minimum of two tests in areas as directed by Architect.
 - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform 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 6.24 lbf/sq. ft., and shall not evidence water penetration.
 - a. Test Area: Insert requirements.
 - b. Perform a minimum of two tests in areas as directed by Architect.
 - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 3. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Test Area: A minimum area of 75 feet by one story of glazed aluminum curtain wall.
- C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 08 44 13

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 4. Division 08 Section "Glazed Aluminum Curtain Walls"
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Hardware Supplier and Hardware Installer must obtain a license with the Louisiana Office of State Fire Marshall in accordance to RS 40:1464 and RS 40:1664.
- B. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- C. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- D. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- E. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.
- F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

- a. Hager Companies (HA).
- b. Pemko (PE).

2.4 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

- a. Hager Companies (HA) - ETW-QC (# wires) Option.
- b. McKinney (MK) - QC (# wires) Option.

- B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

- a. Pemko (PE) - SER-QC (# wires) Option.

- C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

- a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
- b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

- a. Hager Companies (HA) - Quick Connect.
- b. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
1. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).

2.6 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 - 4. Tubular deadlocks and other auxiliary locks.
 - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 6. Keyway: Match Facility Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
 - 1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 - 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - Keymark.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (2)
 - 2. Master Keys (per Master Key Level/Group): Five (5).
 - 3. Construction Keys (where required): Ten (10).
 - 4. Construction Control Keys (where required): Two (2).
 - 5. Permanent Control Keys (where required): Two (2).
- G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.8 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - 8800FL Series.
 - b. Corbin Russwin Hardware (RU) - ML2000 Series.
 - c. Sargent Manufacturing (SA) - 8200 Series.
 - d. Schlage (SC) - L9000 Series.

2.9 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below and in the hardware sets.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
2. Manufacturers:
 - a. Yale Commercial (YA) - 8800FL Series.
 - b. Sargent(SA)—8200 Series.

- c. Schlage(SC)—L9000 Series.

2.10 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. Exit devices shall have a five-year warranty.
 - 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.

- b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 - 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 - 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 - 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
- 1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - 7000 Series.
 - b. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - c. Sargent Manufacturing (SA) - 80 Series.
 - d. Von Duprin (VD) - 35A/98 XP Series.

2.12 ELECTROMECHANICAL EXIT DEVICES

- A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
- 1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 - 2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
 - 3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 - 4. Manufacturers:
 - a. Yale (YA) - 7000 Series.
 - b. Von Duprin (VD) – 35/98A Series
 - c. Sargent (SA)—80 Series.

2.13 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Heavy duty surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - 4400 Series.
 - b. Corbin Russwin Hardware (RU) - DC6000 Series.
 - c. LCN Closers (LC) - 4040 Series.
 - d. Sargent Manufacturing (SA) - 351 Series.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

- a. Stainless Steel: 300 grade, 050-inch thick.
- 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
- 6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).

2.15 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood (RO).
 - c. Ives (IV).

2.16 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. Pemko (PE).
 2. Reese Enterprises, Inc. (RE).

2.17 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 1. Manufacturers:
 - a. Security Door Controls (SD) - DPS Series.
 - b. Securitron (SU) - DPS Series.
- B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.
 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 2. Manufacturers:

- a. Securitron (SU) - AQL Series.
- b. Altronix (AS) - Maximal 11F.

2.18 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

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

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to

operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handling and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. PE - Pemko
 - 3. RO - Rockwood
 - 4. YA - ASSA ABLOY ACCENTRA
 - 5. OT - Other
 - 6. SU - Securitron

Hardware Sets based on plans dated 05/16/2025

Set: 1.0

Doors: 100A

2 Continuous Hinge	CFM__SLF-HD1 SER		PE	⚡
1 Mullion	KRM200 x K820 / Collar	600	YA	
1 Rim Exit, NL, ELR, RX	7100 B MELR 121NL K840	630	YA	⚡
1 Rim Exit, EO, RX	7100 B EO	630	YA	⚡
2 Pull	RM201	US32D	RO	
2 Surface Closer w Stop	UNI4400	689	YA	
2 Drop Plate & Mounting Hardware	as required	689	YA	
1 Threshold	2005AT x Width		PE	
1 Perimeter Seal	by door / frame mfr			
2 Sweep	315CN x Width		PE	
2 ElectroLynx Harness - Frame	QC-C1500P		MK	⚡
2 ElectroLynx Harness - Door	QC-C*** x Length as required		MK	⚡
2 Position Switch	DPS-M/W-WH (as required)		SU	⚡
1 Card Reader	By Security		OT	
1 Power Supply	AQLX-E1 - Size as required		SU	⚡

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 2.0

Doors: 134A, 134B, 135

Description: AL Pr Ext. NL x DT CVR

2 Continuous Hinge	CFM_HD1		PE	
1 Concealed Vert Rod Exit, Classroom	7225 503F K800 Temp Core	630	YA	
1 Concealed Vert Rod Exit, Exit Only	7225 EO	630	YA	
3 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA	
2 Door Pull	BF157	US32D	RO	
2 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA	
1 Gasketing	By Frame Supplier		OT	
2 Sweep	315CN x Width		PE	
1 Threshold	252x3AFG		PE	
2 Position Switch	DPS-x-BK		SU	⚡

Notes: Confirm hardware compatibility with aluminum door supplier.
Notes: Doors are monitored.

Set: 3.0

Doors: 107D, 108C

Description: AL Sgl Ext. NL

1 Continuous Hinge	CFM_HD1		PE
1 Rim Exit Device, Nightlatch	7255 121NL K800 Temp Core	630	YA
2 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Door Pull	BF157	US32D	RO
1 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA
1 Gasketing	By Frame Supplier		OT
1 Sweep	315CN x Width		PE
1 Threshold	252x3AFG		PE
1 Position Switch	DPS-x-BK		SU ⚡

Notes: Confirm hardware compatibility with aluminum door supplier.
Notes: Doors are monitored.

Set: 4.0

Doors: 133A, 133B, 136

Description: Pr Ext. Exit - HM

2 Continuous Hinge	CFM_HD1		PE
1 Mullion	KRM200	600	YA
1 Exit Device (rim, nightlatch)	7155 632F K840 Temp Core	630	YA
1 Exit Device (rim, dummy trim)	7155 634F	630	YA
1 Cylinder	As required - Temp Core	630	YA
4 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
2 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Rain Guard	346C width plus 4"		PE
1 Gasketing	2891APK		PE
2 Astragal Set (2)	303AS		PE
2 Door Bottom w/ drip	210AV		PE
1 Threshold	271A		PE
2 Position Switch	DPS-x-BK		SU ⚡

Notes: Doors are monitored.

Set: 5.0

Doors: 139, 140

Description: Pr Ext. Lock HM

2 Continuous Hinge	CFM_HD1		PE
2 Flush Bolt	555 / 557 12" / 72" AFF	US26D	RO

1 Dust Proof Strike	570	US26D	RO
1 Storeroom or Closet Lock	CRCN 8805FL K820 Temp Core	626	YA
1 Cylinder	As required - Temp Core	630	YA
4 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Coordinator	2672	US28	RO
1 Mounting Bracket	2601xx	US28	RO
2 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Rain Guard	346C width plus 4"		PE
1 Gasketing	2891APK		PE
2 Astragal Set (2)	303AS		PE
2 Door Bottom w/ drip	210AV		PE
1 Threshold	271A		PE
2 Position Switch	DPS-x-BK		SU ⚡

Notes: Doors are monitored.

Set: 6.0 – 1 HR RATED DOOR AND FRAME

Doors: 138, 201, 203A, 203B, 204A

Description: Sgl Ext. Exit - HM

1 Continuous Hinge	CFM_HD1		PE
1 Exit Device (rim, nightlatch)	7155 632F K840 Temp Core	630	YA
2 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Rain Guard	346C width plus 4"		PE
1 Gasketing	2891APK		PE
1 Door Bottom w/ drip	210AV		PE
1 Threshold	271A		PE
1 Position Switch	DPS-x-BK		SU ⚡

Notes: Doors are monitored.

Set: 7.0

Doors: 142

Description: Sgl Ext. Lock - HM - DPS

1 Continuous Hinge	CFM_HD1		PE
1 Storeroom Lock	CRCN 8840FL K820 Temp Core	630	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Rain Guard	346C width plus 4"		PE
1 Gasketing	2891APK		PE
1 Door Bottom w/ drip	210AV		PE
1 Threshold	271A		PE
1 Position Switch	DPS-x-BK		SU ⚡

Notes: Door is monitored.

Set: 8.0

Doors: 100B

Description: AL Pr Int Vestibule Exit

2 Continuous Hinge	CFM_HD1		PE
1 Mullion	KRM200	600	YA
2 Rim Exit Device, Classroom	7255 CR506F K800 Temp Core	630	YA
1 Cylinder	As required - Temp Core	630	YA
5 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
2 Surface Closer with stop	UNI4400 (Brackets/spacer as req'd)	689	YA
1 Gasketing	By Frame Supplier		OT
1 Threshold	252x3AFG		PE

Notes: Confirm hardware compatibility with aluminum door supplier.

Set: 9.0

Doors: 141

Description: Pr Int Elec Panic

6 Hinge (heavy weight)	T4A3786	US26D	MK
1 Mullion	KRM200	600	YA
1 Rim Exit Device, Nightlatch	7100 CR627F K840 Temp Core	630	YA
1 Rim Exit Device, Dummy	7100 CR629F	630	YA
1 Cylinder	As required - Temp Core	630	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
2 Closer w/stop arm	4420	689	YA
2 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Gasketing	S88BL LAR		PE
2 Astragal Set (2)	303AS		PE

Set: 10.0

Doors: 109, 110, 116, 118,

Description: Sgl Int Storage - Closer - Gasket

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom or Closet Lock	CRCN 8805FL K820 Temp Core	626	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Surface Closer	PR/R4400	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406/409/441H Per Conditions	US26D	RO
1 Gasketing	S88BL LAR		PE

Set: 11.0

Doors: 131

Description: Sgl Int Storage - Closer/stop/HO - Gasket

3 Hinge, Full Mortise	TA2714	US26D	MK

1 Storeroom or Closet Lock	CRCN 8805FL K820 Temp Core	626	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Surface Closer w/ HO	4420T	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Gasketing	S88BL LAR		PE

Set: 12.0

Doors: 110B

Description: Sgl Int Storage

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom or Closet Lock	CRCN 8805FL K820 Temp Core	626	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Door Stop	406/409/441H Per Conditions	US26D	RO
3 Silencer	608-RKW		RO

Set: 13.0

Doors: 101, 102, 111, 112, 117, 129, 130, 132

Description: Typical Office - Closer

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Entry Lock	CRCN 8807FL K820 Temp Core	626	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Surface Closer	PR/R4400	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406/409/441H Per Conditions	US26D	RO
3 Silencer	608-RKW		RO

Set: 14.0

Doors: 103, 105, 106, 107, 107B, 108, 108B, 113, 114, 119, 120, 121, 122, 124, 125, 126, 127

Description: Classroom function - Closer - Gasket

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	CRCN 8808FL K820 Temp Core	626	YA
1 Masterkeyed Permanent Core	K800 (Masterkeyed to existing system)	626	YA
1 Surface Closer	PR/R4400	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406/409/441H Per Conditions	US26D	RO
1 Gasketing	S88BL LAR		PE

Set: 15.0

Doors: 103A, 103B, 107A, 107C

Description: Privacy- Closer - Gasket

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Mortise Lock Status Indicator	CRVN 8802 V21	626	YA
1 Surface Closer	PR/R4400	689	YA
1 Kick Plate	K1050 10" BEV CSK	US32D	RO
1 Door Stop	406/409/441H Per Conditions	US26D	RO

1 Gasketing	S88BL LAR	PE

Set: 16.0

Doors: 108A

Description: Passage

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Passage Latch	CRCN 8801FL	630	YA
1 Door Stop	406/409/441H Per Conditions	US26D	RO
1 Gasketing	S88BL LAR		PE

END OF SECTION 087100

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Aluminum Storefront Doors.
 - 2. Aluminum Storefront
 - 3. Aluminum Curtain Walls
 - 4. Interior lites in doors, sidelites, and hollow metal frames.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Re: Structural Drawings for wind loads.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass the following products; 12 inches (300 mm) square.
 - 1. Tinted glass.
 - 2. Coated glass.
 - 3. Laminated glass with colored interlayer.
 - 4. Tempered glass.
 - 5. Insulating glass.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings. **Note provide tempered glass where required by Code or to meet structural criteria at all locations.**
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass glazing sealants and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain insulating glass and single pane glass in storefront doors from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- I. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Insulating Lites: Not less than 1".
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 1/4".
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as $\text{Btu/sq. ft.} \times \text{h} \times \text{deg F} (\text{W/sq. m} \times \text{K})$.

5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- C. Coated Tinted Exterior Safety Lam. Glass at doors: Class 2, complying with other requirements specified.
 - a. Match color of insulated glass..
- D. Tempered Clear Glass – Interior Doors, Windows and sidelites
 1. Provide 1/4" tempered clear glass.

2.3 LAMINATED GLASS (at exterior doors)

- A. Manufacturers: Subject to compliance with requirements, PPG, Guardian, Old Castle:
- B. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.
- C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Vitro (Basis of Design)
 2. Guardian.
 3. Oldcastle
- B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified. Provide at all exterior windows.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 2. Spacer: Manufacturer's standard spacer material and construction Aluminum with mill or clear anodic finish.
 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article. **Provide safety tempered glass wherever required by codes or wind loading.**

2.5 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.
 2. EPDM complying with ASTM C 864.
 3. Silicone complying with ASTM C 1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.6 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. May National Associates, Inc.; Bondaflex Sil 290.

- d. Pecora Corporation; 890.
- e. Sika Corporation, Construction Products Division; SikaSil-C990.
- f. Tremco Incorporated; Spectrem 1.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

- C. Grind smooth and polish exposed glass edges and corners.

2.10 MONOLITHIC-GLASS TYPES

- A. Glass Type : Clear float glass fully tempered float glass for indoor use, provide safety tempered glass where required by code..
 - 1. Thickness: 6.0 mm.
 - 2. Provide safety glazing labeling.

2.11 LAMINATED-GLASS TYPES for Use in Exterior Storefront Doors

- A. Glass Type : Tinted laminated glass with two plies of heat-strengthened float glass with outer ply Class 2 (tinted) and inner ply Class 1 (clear). Color to match insulating Glass.
 - 1. Provide safety glazing labeling.

2.12 INSULATING-GLASS TYPES

- A. Glass Type Exterior for Curtainwall and storefront system: Low-e-coated, tinted insulating glass.
- B. Basis of Design: Vitro Solarban 60 Solar Control Low-E Glass, 1" insulating, Color Solarban 60 (2) + Clear Glass Insulating Unit.
- C. Architect has the right to change glass tint to and maintain the same glass performance.
- D. Approved Manufacturer's: Vitro, Guardian and Oldcastle.
 - 1. Overall Unit Thickness: 1 inch (25 mm).
 - 2. Thickness of Each Glass Lite: 6.0 mm.
 - 3. Outdoor Lite: Tinted , type as required by application
 - 4. Indoor Lite: Clear, type as required by application.
 - 5. Low-E Coating: Sputtered on second surface.
 - 6. Visible Light Transmittance: 45 percent minimum.
 - 7. Winter Nighttime U-Factor: .29 maximum.
 - 8. Summer Daytime U-Factor: .27 maximum.
 - 9. Shading Coefficient: .31
 - 10. Solar Heat Gain Coefficient: .27 maximum.
 - 11. Provide safety glazing labeling.
- E. Spandrel Glass:
 - 1. 1" insulating type, color to match vision glass.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)**.
 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide **1/8-inch (3-mm)** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners

and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

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DIVISION 09 – FINISHES

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For [dimpled steel studs and runners] [firestop tracks], from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: ASTM A 653/A 653M, **G40**, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645.[Use either steel studs and runners or dimpled steel studs and runners.]
1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 20 gauge for studs < 6", 25 gauge for studs 6" or greater.
 - b. Depth: **3-5/8 inches, 6 inches, 2-1/2 inches, 1-5/8 inches.**
 - c. NOTE: STEEL STUDS IN 1 HR. RATED WALL MUST BE SJ TYPE!
 - d. All Studs spaced 16" o.c.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: **0.027 inch.**
- D. Cold-Rolled Channel Bridging: Steel, **0.053-inch** minimum base-metal thickness, with minimum **1/2-inch-** wide flanges.
1. Depth: **1-1/2 inches.**
 2. Clip Angle: Not less than **1-1/2 by 1-1/2 inches, 0.068-inch-** thick, galvanized steel.
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: **0.033 inch.**
 2. Depth: **7/8 inch & 1-1/2 inches.**
- F. Resilient Furring Channels: **1/2-inch-** deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of **1-1/4 inches**, wall attachment flange of **7/8 inch**, minimum uncoated-metal thickness of **0.018 inch**, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch-** diameter wire, or double strand of **0.048-inch-** diameter wire.

- B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
1. Depth: 2-1/2 inches.
- F. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.027 inch.
 - b. Depth: 2-1/2 inches.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock. Use alum grid in wet areas.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. [Armstrong World Industries, Inc.; Drywall Grid Systems.](#)
 - b. [Chicago Metallic Corporation; Drywall Grid System.](#)
 - c. [USG Corporation; Drywall Suspension System.](#)
 - d. .

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls bottom track: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies, min 48" o.c..
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Provide acoustical caulking at bottom track of all stud walls separating classrooms from other spaces.
- D. Install studs so flanges within framing system point in same direction.
- E. Provide angled braced framing at min. 48 " o.c. at all wall not extending to floor or roof deck.
- F. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

- a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs **6 inches** o.c.
- G. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced **24 inches** o.c.
- H. Z-Furring Members:
 - 1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-furring members spaced **24 inches** o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced **24 inches** o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than **12 inches** from corner and cut insulation to fit.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch** from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: **48 inches** o.c.
 - 2. Carrying Channels (Main Runners): **48 inches** o.c.
 - 3. Furring Channels (Furring Members): **16 inches** o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 24 00 - PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Nonstructural steel framing and furring.
 - 2. Exterior portland cement plasterwork (stucco) on metal lath and solid- plaster bases.
 - 3. Exterior finish coat system on Densglass base at soffits and over hangs.
- B. Related Sections include the following:
 - 1. Division 5 Section "Cold-Formed Metal Framing" for structural, load-bearing (transverse and axial) steel studs and joists that support lath and portland cement plaster.
 - 2. Division 6 Section "Rough Carpentry" for wood framing and furring, sheathing, and water-resistant barriers included in portland cement plaster assemblies.
 - 3. Division 7 Section "Building Insulation" for thermal insulations and vapor retarders included in portland cement plaster assemblies.
 - 4. Division 7 Section "Joint Sealants" for [sealants installed with exterior portland cement plaster (stucco)].
 - 5. Division 9 Section "Gypsum Plaster" for gypsum-based conventional plaster and associated lath.
 - 6. Division 9 Section "Gypsum Veneer Plaster" for gypsum-based veneer plaster applied on gypsum base for veneer plaster, unit masonry, and monolithic concrete.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.
- C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

- D. Samples for Verification: For each type of finish coat indicated; **12 by 12 inches**, and prepared on rigid backing.

1.4 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than **40 deg F**.
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include manufacturers specified.

2.2 NONSTRUCTURAL STEEL FRAMING MEMBERS, GENERAL

- A. Manufacturers:

1. California Expanded Metal Products Company (CEMCO).
 2. Clark Steel Framing Systems.
 3. Consolidated Systems, Inc.
 4. Dale/Incor.
 5. Dietrich Industries, Inc.
 6. Marino/Ware; Division of Ware Industries, Inc.
 7. Phillips Manufacturing Co.
 8. SCAFCO Corporation.
 9. Unimast, Inc.
 10. Western Metal Lath & Steel Framing Systems.
- B. Components, General: Comply with ASTM C 1063. For steel sheet components not included in ASTM C 1063, comply with ASTM C 645 requirements for metal, unless otherwise indicated.
- C. Cold-Rolled Channels: Base metal thickness of 0.0538 inch with ASTM A 653, G60, hot-dip galvanized zinc coating.
- D. Wire: ASTM A 641, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

2.3 METAL LATH

- A. Expanded Self Furring Paperback-Metal Lath: ASTM C 847 with ASTM A 653, G60, hot-dip galvanized zinc coating.
1. Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. California Expanded Metal Products Company (CEMCO).
 - c. Dale/Incor.
 - d. Marino/Ware; Division of Ware Industries, Inc.
 - e. Phillips Manufacturing Co.
 - f. Unimast, Inc.
 - g. Western Metal Lath & Steel Framing Systems.
 2. Diamond-Mesh Lath: Self-furring
 - a. Weight: 3.4 lb/sq. yd.

2.4 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Zinc Accessories:

1. Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. California Expanded Metal Products Company (CEMCO).
 - c. Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. Phillips Manufacturing Co.
 - f. Unimast, Inc.
 - g. Western Metal Lath & Steel Framing Systems.
2. Foundation Weep Screed: Fabricated from hot-dip galvanized steel sheet, ASTM A 653, **G60** zinc coating.
3. Cornerite: Fabricated from metal lath with ASTM A 653, **G60**, hot-dip galvanized zinc coating.
4. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653, **G60**, hot-dip galvanized zinc coating.
5. Cornerbeads: Fabricated from zinc.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - b. Small nose cornerbead with perforated flanges; use on curved corners.
 - c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
 - d. Bull nose cornerbead, radius **3/4 inch** minimum, with expanded flanges; use at locations indicated on Drawings.
6. Casing Beads: Fabricated from zinc; square-edged style; with expanded flanges.
7. Control Joints: Fabricated from zinc; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
8. Expansion Joints: Fabricated from zinc; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
9. Two-Piece Expansion Joints: Fabricated from zinc; formed to produce slip-joint and square-edged reveal that is adjustable from **1/4 to 5/8 inch** wide; with perforated flanges.

2.5 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, **1/2 inch** long, free of contaminants, manufactured for use in portland cement plaster.

- C. Bonding Compound: ASTM C 932.
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- F. Wrap: Provide Tyvek "Stucco Wrap" on 15# felt under all metal lath and over coated densglass sheathing. Overlap and tape Stucco Wrap per manufacturer's instructions.
- G. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2.6 VENEER SYSTEMS AT SOFFITS

- A. Synthetic mesh bedded in synthetic skim coat approved by top coat manufacturer.

2.7 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Color for Finish Coats: Gray.
- B. Masonry Cement: ASTM C 91, Type N.
 - 1. Color for Finish Coats: Gray.
- C. Plastic Cement: ASTM C 1328.
- D. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- E. Sand Aggregate: ASTM C 897.
- F. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
 - 1. Products:
 - a. Dryvit Systems, Inc.
 - b. Tefis Incorporated.
 - c. Senergy, Inc.
 - d. Finestone

2. Color: As selected by Architect from manufacturer's full range.

2.8 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 1. Portland Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 2. Masonry Cement Mixes:
 - a. Scratch Coat: 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: 1 part masonry cement and 3 to 5 parts aggregate.
- C. Factory-Prepared Finish-Coat Mixes:
 1. Tinted Prime Coat
 2. Finish Acrylic Plaster coat – Sand Finish

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

- B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.
- B. Sound Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- C. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLING METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 1063.
 - 1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
 - 2. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.
 - 3. Curved-Ceiling Framing: Install flat diamond-mesh lath.
 - 4. On Solid Surfaces, Not Otherwise Furred: Install self-furring diamond-mesh lath.

3.5 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 - 1. Install lath-type external-corner reinforcement at exterior locations.
 - 2. Install cornerbead at interior and exterior locations. Install corner beads at all perimeter areas where dissimilar materials meet, vertical and horizontal surfaces.
- C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows, (whether shown on plans or not) at areas not exceeding 144 sf or at change of direction.:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft..
 - b. Horizontal and other Nonvertical Surfaces: 100 sq. ft.
 - 2. At distances between control joints of not greater than 12 feet o.c.
 - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 - 4. Where control joints occur in surface of construction directly behind plaster.

5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.6 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 1. Do not deviate more than plus or minus **1/4 inch in 10 feet** from a true plane in finished plaster surfaces, as measured by a **10 foot** straightedge placed on surface.
 2. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, before lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least **6 inches** at each jamb anchor.
 3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry and concrete plaster bases.
- C. Plaster Finish Coats: Apply to provide sand finish to match Architect's sample.
- D. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.7 CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00.

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board everywhere items 2 4 & 5 are not.
 - 2. Interior high impact gyp bd – 8’ high on all walls. (continue above 8’ with non impact as required per wall sections).
 - 3. Exterior gypsum board for ceilings and soffits.
 - 4. Moisture resistant gyp. bd. @ toilet rooms.
 - 5. Tile backing panels.
 - 6. Gyp Bd. finishes.
 - 7. ALUMINUM REVEALS, INCLUDING LED BACKLIT REVEALS
- B. Related Requirements:
 - 1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 2. Section 09 30 00 "Tiling" for cementitious backer units installed as substrates for ceramic tile.
 - 3. UL Design U419

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <5> percent.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Georgia-Pacific Gypsum LLC.
 - 2. National Gypsum Company.
 - 3. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M. Thickness: 5/8 inch.
 - 1. Long Edges: Tapered.
 - 2. All interior walls located in a 1, 2, 3, or 4 hour fire rated designation are subject to compliance with UL Design U419. Materials installed in any location required to be in full compliance with UL design U419 no exceptions.
- C. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M. **Install 8' above floors on all walls to receive gyp. bd.**

1. [GP "Tough Rock", USG "AR"](#)
 2. Core: 5/8 inch, Type X.
 3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 6. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
 7. Long Edges: Tapered.
 8. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - 9.
- D. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
1. Thickness: 1/4 inch.
 2. Long Edges: Tapered.
- E. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces. Use at all toilet rm. ceilings and in wet areas.
1. Core: 5/8 inch, Type X. on walls, 1/2" on ceilings.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
1. [Products:](#) Subject to compliance with requirements, provide one of the following:
 - a. [Georgia-Pacific Gypsum LLC; Dens-Glass Gold.](#)
 - b. [National Gypsum Company; Gold Bond, e\(2\)XP.](#)
 - c. [USG Corporation; Securock Glass Mat Sheathing.](#)
 2. Core: 5/8 inch

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. [Products:](#) Subject to compliance with requirements, provide one of the following:
 - a. [C-Cure; C-Cure Board 990.](#)
 - b. [Custom Building Products; Wonderboard.](#)
 - c. [James Hardie Building Products, Inc.; Hardiebacker 500.](#)
 - d. [National Gypsum Company, PermaBase Cement Board.](#)
 - e. [USG Corporation; DUROCK Cement Board.](#)
 2. Thickness: 5/8 inch.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C 1047.
 - 1. Material: Rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Aluminum Trim: See Drawings: Extruded accessories of profiles and dimensions indicated at exposed edges on multilayered applications or u.n.o.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- D.
 - a. Fry Reglet Corp. – basis of design.
 - b.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish: Class II anodic finish.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats Level 4 finish.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.

- D. Joint Compound for Exterior Applications:
 - 1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer and synthetic stucco manufacturer.
- E. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.
 - 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch** thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
 - 3. For exterior applications, use non-corrosive type screw per manufacturer's recommendations.
- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - d. USG Corporation; SHEETROCK Acoustical Sealant.
 - 2. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."
- F. Vapor Retarder: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber,

including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
Caulk base of all interior walls.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: 5/8" on interior ceilings and fur downs and above 8' on walls.
 - 2. Type X: Vertical surfaces unless otherwise indicated above Hi Impact resistant gyp. bd.
 - 3. Flexible Type: Apply in double layer at curved assemblies.
 - 4. Hi Impact Bd 8' high on all walls except in individual toilet rooms..
 - 5. Moisture- and Mold-Resistant Type: Optional for type X in all wet areas, with hot mud at shower rooms.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints. Apply abuse resistant gyp. bd. 4' ht aff.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at [showers, tubs, and where indicated] [locations indicated to receive tile].
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints [at locations indicated on Drawings] [according to ASTM C 840 and in specific locations approved by Architect for visual effect].
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where gyp. bd abuts any dissimilar material.
 4. U-Bead: Use at exposed panel edges.
 5. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. L-Bead: Use at exposed panel edges abutting any dissimilar materials.
- E. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile Panels that are substrate for acoustical tile.
 - 3. Level 3: Above ceilings or areas not visible..
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 - CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Ceramic Tile in select areas of restroom floors and walls (see finishes plan).
 - 1. Ceramic tile.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Tile backing panels.
 - 5. Metal edge strips.
- B. Related Sections:
 - 1. Section 09250 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum >.60 wet or dry..

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - a. .
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish tile from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Joint sealants.
 - 5. Cementitious backer units.
 - 6. Metal edge strips.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.

- E. Preinstallation Conference: Conduct conference at Project site. The owner, architect, general contractor, and tile installer must be present at the meeting with a recorded sign in sheet. The mortar representative must also attend this meeting for quality assurance. The tile installer must demonstrate his methods of installation proving that tile joints will be installed in a controlled environment to prevent discoloration in the mortar. The tile mortar and grout representative (such as Mapei) must be present on site during the first day of tile grout installation, along with the architect, owner, installer, and general contractor. Failing to follow this procedure may result in removing the tile in its entirety and starting over. PROTECT ALL TILE BY ALL NECESSARY MEANS TO PREVENT DICOLORATION OF GROUT.**

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements unless otherwise indicated.

- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- D. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

Special Note: The mortar and grout shall come from a single source manufacturer as to not void warranties or interrupt quality assurance.

- A. Tile Type T-1. As indicated in drawings:
 - a. Tilebar – *(Finish Schedule overrides spec if different)*
 - b. COLOR: See finish Schedule
- B. Alternate manufacturers
 - 1. Daltile
 - 2. Marazzi
- C. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as adjoining wall tile.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of [10] per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. C-Cure; C-Cure Board 990.
- b. Custom Building Products; Wonderboard.
- c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
- d. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.

- B. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Boiardi Products; a QEP company; Elastiment 323 Cement Based Waterproofing, Anti-Fracture/Crack Suppression Membrane.
- b. C-Cure; UltraCure 971.
- c. MAPEI Corporation; Mapelastic (PRP 315).
- d. Southern Grouts & Mortars, Inc.; Southcrete 1100.
- e. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

2.5 SETTING MATERIALS

The mortar and grout in the quarry tile installation must meet the requirements for a commercial kitchen environment. This includes extreme temperatures in freezer/cooler environments and the ability to withstand temperature shock ranges from boiling water spills in the kitchen.

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
4. Laticrete 371 fortified mortar bed, min. thickness 1 – ½" thickness at floor drains.
5. Membrane - 2 coats of Hydroban over mud bed and turn up walls 4". Caulk any joints larger than 1/8" with Latacil.
6. Thin Set - Laticrete 254 Platinum Thin-set

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [C-Cure.](#)
 - b. [Laticrete International, Inc.](#)
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
4. Laticrete 371 fortified mortar bed, min. thickness ½".
5. Membrane - 2 coats of Hydroban over mud bed and turn up walls 4". Caulk any joints larger than 1/8" with Latacil.
6. Thin Set - Laticrete 254 Platinum Thin-set

2.6 GROUT MATERIALS

A. Epoxy Grout:

1. [Basis-of-Design Product:](#) Subject to compliance with requirements, provide Laticrete SpectraLOCK 2000IG or comparable product by one of the following:
 - a. [C-Cure.](#)
 - b. [Laticrete International, Inc.](#)
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07920 "Joint Sealants."

- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 550.
 - b. Degussa Building Systems; Sonneborn Sonolastic SL 2.
 - c. Sika Corporation; Sikaflex-2c SL.
- D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Laticrete 254 Platinum
- E. Latex- Thin Set Mortar for glass tile:
 - 1. Laticrete Glass Tile Adhesive.
- F. Latex Laticrete 255 Multimax at shower ceilings over Hydroban

2.8 GROUT MATERIALS

- A. Epoxy Grout:
 - 1. Basis-of-Design Product:
 - 2. Laticrete Spretalock Pro premium grout for all floors, wall and ceilings for normal tile.
 - 3. Spectra 200 IG epoxy grout at all quarry tile floors.
 - 4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

2.9 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07920 "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Latisil (only)

2.10 Waterproof and Crack Isolation Membranes:

- A. General: Apply over all mortar beds on floors, cement backerboards on walls and ceiling to receive tile:
 - 1. Laticrete: Hydroban (2 coats min.)

2.11 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; white zinc alloy nickel silver exposed-edge material. Provide where quarry tile meets VCT.
- C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.12 MIXING MORTARS AND GROUT

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 3/16 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 - 2. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane waterproofing or crack isolation membrane with elastomeric sealant.
- J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F114: Cement mortar bed (thickset) with cleavage membrane; epoxy grout; TCA F114 and ANSI A108.1B.
 - a. Tile Type: All Floor Tile.
 - b. Thin-Set Mortar for Cured-Bed Method: Latex- portland cement mortar compatible with Epoxy Grout.
 - c. Grout: Epoxy; see above grout.
2. Tile Installation F115: Thin-set mortar; epoxy grout; TCA F115 for base.
 - a. Tile Type: Base.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Epoxy; see above

B. Shower Wall Installations, Metal Studs:

1. Tile Installation B412: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCA B412.
 - a. Tile Type: Wall Tile.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Water-cleanable epoxy grout.

END OF SECTION 09310

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Related Requirements:
 - 1. Section 09 51 23 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with fully concealed suspension systems, stapling, or adhesive bonding.
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
 - 3. Clips: Full-size hold-down clips.
- E. Delegated-Design Submittal: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Ceiling suspension-system members.
 2. Structural members to which suspension systems will be attached.
 3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 5. Size and location of initial access modules for acoustical panels.
 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
- B. Qualification Data: For testing agency.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Units: Full-size panels equal to 3 percent of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

3. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockup of typical ceiling area as shown on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design seismic restraints for ceiling systems.

2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
 2. United States Gypsum Company.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows: (Armstrong Ceilings Basis of design)
1. ACT -1 (typical 2'x2' tile in all rooms other than toilet rooms and wet areas) and Form: "School Zone" Fine Fissured #1713
 - a. Edge: Square
 - b. NRC: .70
 - c. CAC: .40
 - d. Color: White
 - e. Thickness: ¾" – MUST BE A MINIMUM OF ¾" IN THICKNESS, NO EXCEPTIONS.
 - f. Light Reflectance: .85
 - g. Sag Resistance: Humiguard +
 2. ACT -2 (2'x2' tile, in toilet rooms) "Ceramaguard #607"
 - a. Edge: Square
 - b. NRC: .55
 - c. CAC: .38
 - d. Color: White
 - e. Thickness: 5/8"
 - f. Light Reflectance: .82
 - g. Sag Resistance: Humiguard +
 - h. Anti-Microbial
 - i. Scrubbable
 3. ACT -3 (2'x2' rooms with coiling garage doors) HealthZone "Ultima" #1935
 - a. Edge: Square
 - b. NRC: .70
 - c. CAC: .35
 - d. Color: White
 - e. Thickness: ¾"
 - f. Light Reflectance: .86

- g. Sag Resistance: Humiguard +
 - h. Anti-Microbial
 - i. Scrubbable
- 4. ACT – 4 (In administration conference room) Armstrong Metalworks Open Cell
 - a. Armstrong 619M1 24”x24”
 - b. 8” interior cell size
 - c. 90% open, Class A
 - d. color: white
 - e. Installs in standard 9/16” T-bar suspension system
 - f. See plans for overall design and layout

METAL SUSPENSION SYSTEM

- a. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - i. ACT-1, & ACT - 4
 - 1. Armstrong Prelude XL
 - 2. USG – DX
 - ii. ACT-2 , ACT-3 & ACT-5: Scrubbable Moist Areas, (Kitchen & Toilet rooms)
 - 1. A. Armstrong – Prelude XL + Al cap – 15/16”wide
 - 2. USG - ZXLA – 15/16” wide
 - iii. Gypsum Board Suspension Systems.
 - 1. Armstrong Drywall grid system with 1 – ½” wide face, G40 hot dipped galvanized.
 - 2. USG – DGLW Drywall Grid System with 1-1/2” wide face, G40 hot dipped galvanized.
- b. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 - i. High-Humidity Finish: In toilets, locker rooms and kitchens, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.

2.ACCESSORIES

- a. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- b. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - i. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - ii. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 - iii. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.

- iv. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
- c. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- d. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- e. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.
- f. Hold-Down Clips: Manufacturer's standard hold-down.
- g. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- h. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- i. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- j. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

3.METAL EDGE MOLDINGS AND TRIM

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Armstrong World Industries, Inc.
 - ii. United States Gypsum Company.
- b. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - i. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - ii. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

4.ACOUSTICAL SEALANT

- a. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

2.EXECUTION

1.EXAMINATION

- a. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- b. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- c. Proceed with installation only after unsatisfactory conditions have been corrected.

2.PREPARATION

- a. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- b. Layout openings for penetrations centered on the penetrating items.

3.INSTALLATION

- a. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
 - i. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- b. Suspend ceiling hangers from building's structural members and as follows:
 - i. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - ii. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - iii. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - iv. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

- v. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - vi. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - vii. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - viii. Do not attach hangers to steel deck tabs.
 - ix. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - x. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - xi. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- c. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- d. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
- i. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - ii. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 - iii. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- e. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- f. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
- i. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 - ii. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 - iii. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - iv. Install hold-down clips gang toilet rooms and within 24' of exterior doors; space according to panel manufacturer's written instructions unless otherwise indicated.

1. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
- v. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

4.ERECTION TOLERANCES

- a.Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- b.Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

5.CLEANING

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

END OF SECTION 09 51 13

SECTION 09 64 20 – ATHLETIC WOOD FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Related work specified under other sections.
- B. Provide wood flooring at both gyms.

1. CONCRETE SUBFLOORS - SECTION 033000

- a. Slab depression is:
 - 3-1/8" for 25/32" flooring with (3/8" pad)
- b. The general contractor shall furnish and install the concrete subfloor depressing the slab sufficiently to accommodate the floor system. The slab shall be steel troweled and finished smooth to a tolerance of 1/8" in any 10' radius by the general contractor. High spots shall be ground level, and low spots filled in with approved leveling compound by the general contractor to the full approval of the installer (Flooring Contractor).

2. MEMBRANE WATERPROOFING - SECTION 072600 Under Slab Vapor Barrier

- a. Concrete subfloors on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on earth side of below grade walls by general contractor using suitable type membrane.

3. GAME STANDARD INSERTS - SECTION 116623 Gymnasium Equipment

- a. 3 pair of volleyball inserts.
- b. Blocking and hold downs for portable basketball goals at main gym.

1.2 REFERENCES

- A. MFMA - Maple Flooring Manufacturers Association
- B. DIN - Performance Standard DIN 18032, Part 2.

1.3 QUALITY ASSURANCE

A. MANUFACTURER

- 1. Approved systems
 - i. Connor DuraCushion III (basis of design)
 - ii. Horner Safe 1
 - iii. Action Floors – Action Cush II Plus
 - iv. Aacer Sports Flooring – Aacer Cush I+
 - v. No exceptions other than above

2. Manufacturer of flooring and subfloor components must be ISO 9001:2008 Certified to assure quality control of materials provided.

B. INSTALLER (Flooring Contractor)

1. The complete installation of the flooring system, as described in the scope of these specifications, shall be carried out by an experienced installer (Flooring Contractor), and the work shall be performed in accordance with most recent installation instructions of the manufacturer. The floor installer must be approved by floor manufacturer to install floor products.
2. Installer (Flooring Contractor) shall be liable for all matters related to installation for a period of one year after the floor has been substantially installed and completed.

C. PERFORMANCE TESTING

1. Flooring system shall have been independently tested and evaluated for Athletic Performance according to the International Standard DIN 18032, Part 2.
2. DIN testing engineer shall be an ISO 17025 System member rated for each performed test conducted.
3. Independent DIN testing laboratory shall have Scientific Body Membership in the International Association of Sports Surface Sciences (ISSS).
4. Flooring system shall have been independently tested and evaluated for Engineering Performance according to the Structural Testing and Engineering Measures (STEM).

1.4 SUBMITTALS

- A. Specification – Flooring system specification sheets.
- B. Sample - Submit one sample of specified system, if requested by architect.
- C. Maintenance Literature - Upon completion of floor installation, send to owner, attendants or individuals in charge and responsible for the upkeep of the building a CARE CARD. This card spells out care and maintenance instructions including temperature and humidity ranges for areas where flooring is installed.

1.5 WORKING CONDITIONS

- A. The wood flooring specified herein shall not be installed until all masonry, painting plaster, tile, marble and terrazzo work is completed, and overhead mechanical trades and painters have finished in the wood floor areas. The building shall be enclosed and weathertite.

- B. The concrete subfloor shall be determined dry by industry standard testing procedures, free of foreign materials and turned over to the installer (Flooring Contractor) broom clean. Moderate room temperature of 65 degrees or more shall be maintained a week preceding and throughout the duration of the work. Humidity conditions within the building shall approximate the humidity conditions that will prevail when the building is occupied.
- C. Permanent heat, light and ventilation shall be installed and operating during and after installation, maintaining a range of temperature and humidity compatible with the expected low and high moisture content of the flooring. The wood moisture content range is determined by the flooring contractor based on the facility's mechanical controls and/or geographical location.
- D. Flooring must be stored in a dry, well-ventilated area, not in contact with masonry, to acclimate to building conditions and shall be installed at moisture content compatible with the normally expected environmental range of temperature and relative humidity achieved while the facility is occupied.
- E. General Contractor shall lock floor area after floor is finished to allow proper cure time. If general contractor or owner requires use of gym after proper cure time, he shall protect the floor by covering with non-marring Kraft paper or red rosin paper with taped joints until acceptance by owner of complete gymnasium floor.
- F. Working conditions as described above shall be followed. Variations and substitutions shall be submitted for approval to the architect who shall advise floor manufacturer of the same.

1.6 HUMIDITY CONTROL

- A. Since all wood flooring will expand and contract as relative humidity varies, it is important to minimize extremes between low and high. Hardwood flooring is manufactured at moisture content most compatible with a 35%-50% relative humidity range. Geographical regions and available mechanicals determine the typical range of temperature and humidity for each facility. Maintaining a 15% fluctuation between highest and lowest average indoor relative humidity provides limited shrinkage and growth. Provide flooring joint spacers at 24" o.c. to allow floor to grow in high humid coastal regions. Facility managers should make use of available HVAC systems to prevent excessive tightening and shrinkage of flooring.

1.7 WARRANTY

- A. Manufacturer warrants that the materials it has supplied will be free from manufacturing defects for a period of one year. The foregoing warranty is in lieu of and excludes all other warranties not expressly set forth herein, whether express or implied in operation of law or otherwise, including, but not limited to, any implied warranties of merchantability or fitness. This warranty is expressly limited to the flooring materials (goods) supplied by Manufacturer. This warranty does not cover floor damage caused (wholly or in part) by fire, winds, floods, moisture, other unfavorable atmospheric conditions or chemical action, nor does it apply to damage caused by ordinary wear, misuse, abuse, negligent or intentional misconduct, aging, faulty building

construction, concrete slab separation, faulty or unsuitable subsurface or site preparation, settlement of the building walls or faulty or unprofessional installation of Connor flooring systems.

B. Should have discovered, any claimed breach.

1.8 EXTRA MATERIALS:

A. Furnish extra materials described below before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wood Flooring and floor treatment: Equal to 1 percent of amount installed fore each type and finish indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Barrier - 15-mil polyethylene.

B. Resilient Pads

1. Cushion pads, 3/8" thick X 2-1/4" X 3" ribbed pads with ability to compress 1/16" under a load of 40 psi without displacement.

C. Sleepers - Nominal 2" X 3" X 4' Spruce, or Fir, kiln dried, with 5 pads attached 12" on center.

D. Subfloor - 15/32" APA rated plywood sheathing, Exposure 1.

E. Flooring Maple

1. 25/32" X 2-1/4", Second & Better Grade, Northern Hard Maple Flooring, TGEM, MFMA Grade marked and stamped. Matching: Continuous Tongue and groove and end matched.

2. Backs: Channeled, (kerfed) for stress relief.

F. Fasteners

1. Flooring - 2" barbed cleats or coated staples.
2. Subfloor - 1-1/2" coated staples.

G. Thresholds: Min. 3/16" extruded aluminum x 4" wide x width of joint. Threshold shall have beveled edges and countersunk flush No. 10 screws @ 8" o.c.. Provide at each flush floor transition and at all doors.

H. Finishing Materials: - the following products shall be used.

a. Floor Products:

- i. Hillyard Gold Medalist Sealer
- ii. Hillyard Gym Line Paint, colors as selected by architect.

iii. Hillyard 450 Gym Finish

- I. Wall Base - 3" X 4", heavy duty, molded, vented cove base with pre-molded outside corners.
- J. Accessory Materials:
 - 1. Reducer Strip: 2" wide, tapered on one side and in thickness matching flooring.
 - 2. Mops: Provide 3 Super HiTone treated dust mops.
- K. Inserts: Flooring installer shall install volleyball and main court basketball portable goal floor covers flush with finished wood floor. Install per manufacturer's instructions.
- L. Provide blocking under main court basketball portable goals to support the weight of the goal base.

PART 3 - EXECUTION

3.1 EXECUTION

- A. Flooring Installer will Inspect concrete slab for proper tolerance and dryness. Report any discrepancies to general contractor and architect in writing.
- B. Concrete slab shall be broom cleaned by general contractor in acceptance with flooring installer's requirements.
- C. Installer (Flooring Contractor) shall document all working conditions provided in General Specifications prior to commencement of installation.

3.2 INSTALLATION (Per Manufacturer's recommendations if different from below)

- A. Subfloor
 - 1. Cover concrete with poly, sealing and lapping joints a minimum of 6".
 - 2. Install sleepers at right angles to finish flooring 12" on center. Space ends 1/4" and offset joints 24" in adjacent rows. Provide 2" expansion voids at perimeter and at all vertical obstructions. Inspect sleepers to be sure that all pads bear on the concrete subfloor. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
 - 3. Attach plywood subfloor with 8' edges parallel to and resting on sleepers. Set plywood in staggered brick pattern and offset plywood end joints by 1' from sleeper end joints, 1/4" spacing at all edges. Fasten plywood to sleepers using 1-1/2" staples fastened 12" on center.
- B. Maple Flooring
 - 1. Install maple flooring by power nailing or stapling approximately 12" on center with end joints properly driven up.

2. If required, size joints between flooring strips to allow for intermediate expansion in accordance with local humidity conditions.
3. Provided 2" expansion voids at perimeter and at all vertical obstructions.

3.3 FINISHING

A. Maple Flooring

- 2 Machine sand floor three times with coarse, medium, and fine paper to a smooth, even and uniform surface.
 - a. After sanding thoroughly sweep and vacuum floors. Tag rag with a Turkish towel dampened with Hillyard Kleen-Up Solvent until no traces of sanding dust remain on floor. Final dust removal using Chix Masslin Dust Cloth (CH1214) prior to applying sealer.
 - b. Sealing:
 - i. Apply the first of coat of sealer ,(350 -500sf/gal), using a Multi-Flo XP or heavyweight T-Bar applicator. After first coat is dry (~12 hrs.), abrade entire surfaces using Hillyard maroon pads or 120 grit screens, (250 sf. ft./side on each) under a single brush floor machine.
 - ii. Floor shall be tacked with Hillyard Tack-It or Pre-Game solution.
 - iii. Apply a second coat of sealer, (450-500sf. ft/gal. applied using one the approved applicators listed above.
 - iv. Allow to dry overnight.
 - v. After drying overnight, entire surface must be abraded with Hillyard maroon pads (250sf.ft/side) under a floor machine and tacked with TACK-It or Pre-Game solution in preparation for court layout and painting.
 - c. Court Lining:
 - i. Prior to paint lines tack all surfaces with Chix Masslin tacking system.
 - ii. Mark game lines with gym line paint. Main Basketball court – 50' x 94', min. of two-inch lines, provide solid color in key top, lane, and mid court circle. Provide a 4-foot wide border all around main court. Provide all lines per La High School Association regulations. Total of three colors.
 - iii. Volleyball Courts (3) – Stripe as per La High School Association. 2 at gym
 - iv. Practice Free Throw Lines – provide 4' long lines at each side goal.
 - v. School Letters and Mascot: at mid court, beveled, block type in mid-court circle. Architect to provide design. Provide a \$12,000 allowance for the lettering and mascot artwork application. See plans for basic design of court layout and logos.
 - vi. Note: Remove and tape as soon as the paint starts to set and not allowed to stand overnight.
 - vii. Let Marking paint dry and cure at least 24 hours. Darker paints may require more time.

- viii. Include a signature, 6' long, on each side of the court, to name the court after an alumni member. Architect shall provide the signature graphic.

d. Finishing:

- i. After all lines have thoroughly dried, abrade entire floor with Hillyard maroon pads, (250sq.ft./side) of pad).
 - ii. Tack rag entire floor, with Chix Masslinn tacking system.
 - iii. Apply an even coat of Gold Medal Trophy Finish, (500-600sq.ft./gal.) with approved applicator, allow to dry a min. of 12 hours.
 - iv. Abrade entire floor with Hillyard maroon pads, (250sq. ft./side).
 - v. Tack rag entire floor with Chix Masslinn tacking system.
 - vi. Apply a final of 450 Gym Finish, (500sq. ft./gal).
 - vii. Do not use floor for 72 hours. Avoid heavy traffic for at least 7 days.
- e. Note: During product application and drying time, floor must be free of dust and dirt. For the first 4 hours, avoid air currents that carry dust and dirt. Temperatures of the floor, room and materials should be between 60 degrees F and 90 degrees F. during treatment and curing. Allow adequate ventilation for proper curing.
- f. Sealer, paints, and finish materials must be abraded with 120-150 grit screens, (instead of maroon pads) if allowed to cure more than 48 hours between coats. Coarseness of abrasion is directly dependent on the length of curing of the coating products between each applications. Tack immediately prior to coating application using the Chix Masslin tacking system.

- 3 Apply a second finish coat of Trophy Finish and allow to dry 48 hours before any foot

3.4 BASE INSTALLATION

- A. Install vent cove base to walls with base cement or screws. Use pre-molded outside corners and mitered inside corners.

3.5 CLEANING

- A. Remove excess and waste materials from the area of work.

END OF SECTION 09 64 20

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.
 - 2. Rubber stair accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 20 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE (RB-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Flexco (Basis of design).
 2. Mannington Mills, Inc.
 3. Johnsonite; a Tarkett company.
 4. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 1. Style and Location:

- a. Style - Cove: Provide in areas with resilient floor coverings, carpet, and sealed concrete areas. Provide base for all rooms.
 - b. Install around all millwork, including teacher cabinets.
 - c. Install around all pilasters & exposed columns.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches
- E. Lengths: Coils in manufacturer's standard length, installed continuously.
- F. Outside Corners: Preformed corners are to be used throughout.
- G. Inside Corners: Preformed corners are to be used throughout.
- H. Colors: per mfg'r standard colors.

PART 3 - EXECUTION

3.1 Hold a preinstallation meeting with the resilient base and adhesive manufacturer's representatives present. The installer must demonstrate full compliance with the written installation procedures published by the product manufacturers. Any deficiencies apparent in the form of surfaces waves and areas where resilient base has air pockets behind the base will be rejected. The installer must have a minimum of 5 years of experience with a project list of resilient base installations. If the installers need language interpreters, the GC shall provide so in the meeting

3.2 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.3 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.4 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in continuous lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Use base manufacturer's recommended adhesive. Follow instructions for applying to both wall and base for adhesive contact.
1. Roberts 7200 adhesive

2. Henry 440
3. Loctite Power Grab
4. MD Building Products 75507

- F. Do not stretch resilient base during installation.
- G. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- H. Preformed Corners: Install preformed corners before installing straight pieces. Only preformed corners are to be used.
- I. Failure of installed products in the form of delamination from the substrate on 3 or more occurrences will be construed as improper installation by unskilled workers and the owner will at that point exercise article 14.2.1.1 of the A201 in which a qualified installer will be engaged at the general contractor's expense.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum horizontal surfaces thoroughly.
 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
 1. Owner to apply floor polish.
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 096516.23 – Resilient Sheet Flooring

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Resilient sheet vinyl flooring

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer Certifications:
 - 1. Provide certification that accurately identifies the Original Equipment Manufacturer (OEM) of flooring furnished for this project including manufacturer's name, address and factory location.
 - a. Suppliers of Private-Label flooring for this project must identify themselves as such and fully disclose the OEM information listed above.
 - b. All "manufacturer" requirements in these specifications must be complied with by the OEM, including warranties, certifications, qualifications, product data, test results, environmental requirements, performance data, etc.
 - 2. Provide ISO 9001 certification for the OEM of the specified products.
 - 3. Provide ISO 14001 certification for the OEM of the specified products.
 - 4. Provide ISO 45001 certification for the OEM of the specified products.
 - 5. Provide ISO 50001 certification for the OEM of the specified products.
- C. Shop Drawings: Showing installation details and locations of borders, patterns, locations of floor inserts and seams.
- D. Samples:
 - 1. Manufacturer's color chart for selection of available floors
 - 2. Product samples:
 - a. Samples to be a minimum of 6" x 9"

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For a qualified resilient flooring Manufacturer.
2. For a qualified resilient flooring Installer.

1.4 CLOSEOUT SUBMITTALS

A. Submit three copies of the following:

1. Manufacturer maintenance instructions.
2. Manufacturer material warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. ISO 9001 Certified.
2. ISO 14001 Certified.
3. ISO 45001 Certified.
4. ISO 50001 Certified.
5. At least ten years active experience in the manufacture and marketing of commercial resilient flooring.
6. A provider of authorized installer training.

B. Installer Qualifications:

1. At least five years experience in the installation of resilient flooring.
2. Experience on at least five projects of similar size, type and complexity as this project.
3. Employer of workers for this Project who are competent in techniques required by manufacturer for resilient flooring installation indicated.

C. Fire Test Characteristics: As determined by testing identical products according to ASTM E648, Class 1, by a qualified testing agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store flooring and installation materials in protected dry spaces, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55° F (18° C) nor more than 85° F (29° C).
- B. Store the indoor resilient surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to project.

1.7 FIELD CONDITIONS

- A. Product Installation:
 - 1. Maintain temperatures during installation within range recommended by manufacturer, but not less than 65° F (18° C) in spaces to receive flooring one week before installation, during installation, and maintain thereafter installation.
 - 2. After installation, maintain temperatures within range recommended by manufacturer, but not less than 65° F (18° C) or more than 85° F (29° C).
 - 3. Prohibit traffic during the flooring installation.
 - 4. Refer to the adhesive technical data sheet for appropriate time for traffic after installation.
- B. Install flooring only after other finishing work, including painting and overhead work, has been completed.

1.8 WARRANTY

- A. Manufacturer warrants that flooring products are free from defects. Refer to product-specific warranty document for additional detail and warranty period.
 - 1. Material warranty must be direct from the product manufacturer.
 - 2. Material warranties from separate or third-party insurance providers are not valid.
 - 3. Material warranties from private label distributors are not valid.
 - 4. Failures include the following:
 - a. Material manufacturing defects.
 - 5. Warranty Period:
 - a. For materials: 10 years from date of Substantial Completion.

1.9 ENVIRONMENT AND INDOOR AIR QUALITY

A. LEED® Documentation:

1. LEED v4 MR Credit, Building Product Disclosure & Optimization, Environmental Product Declaration: Supply at minimum a product specific UL certified Environmental Product Declaration (EPD)
2. LEED v4 MR Credit, Building Product Disclosure & Optimization, Sourcing of Raw Materials: For products having recycled content, indicate percentage by weight of post-consumer and pre-consumer recycled content.
3. LEED v4 EQ Credits: For adhesives and flooring, including a statement of VOC content, FloorScore® certified.

B. Indoor Air Quality Certification:

1. Flooring products must be FloorScore® Certified.
 - a. FloorScore® certification proves compliance with the volatile organic compound emissions criteria of the California Section 01350 standard.
 - b. FloorScore® certification proves compliance with the testing and product requirements of the California Department of Health Services “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”
 - c. FloorScore® documentation must include a certificate number for specified product.

C. Manufacturer Certification of Environmental Procedures:

1. Original Equipment Manufacturers (OEM) ISO 14001 Certification

D. Manufacturer’s Certification to Inhibit the Spread of Bacteria

1. Product certified ISO 22196 compliant to inhibit the spread of bacteria at 99.9%

1.10 COORDINATION

- A. Coordinate layout and installation of flooring with other equipment.

PART 2 - PRODUCTS

2.1 COMMERCIAL SHEET VINYL FLOORING

- A. Basis-of-Design Manufacture: Subject to compliance with requirements, provide Gerflor Mipolam

Affinity a 2mm thick, 6'6" wide stylish tone on tone non-directional chip homogeneous sheet vinyl product providing excellent wear resistance for high traffic applications. Including the revolutionary Evercare surface treatment.

Flooring installed with full-spread standard adhesive.

- B. Other Manufactures: Subject to compliance with all the requirements of this specification, provide products by one of the following:

1. **Tarkett: iQ EMINENT**
2. **Patcraft: ADMIX**

- C. Product Description: Unbacked homogeneous vinyl sheet floor covering complying with ASTM F1913.

1. Overall Thickness: Not less than 0.08 inch (2.0 mm)
2. Weight must be less than 0.60 pound/sq. ft. (2.9 kg/sq. m)
3. Max static load limit must exceed ASTM F970.
4. Seaming Method: Heat welded.
5. Adhesive Method:
 - a. Full-spread or full-surface adhesive to completely adhere flooring to substrate.
 - b. Complete adhesive coverage to eliminate the possibility of gaps or space between the slab and flooring material where moisture could accumulate and create an environment conducive to mold growth.
 - c. Flooring to be adhered to the concrete slab in all locations eliminating the possibility of waves or wrinkles forming caused by the floor shifting, moving or by rolling loads displacing it.
6. Bacteriostatic Performance: ISO 22196 compliant.
7. 100% REACH Compliant.

8. Applied Finish: Manufacturer's, factory-applied, permanent, laser and UV-cured.
 - a. No-Wax finish: Published product literature identifying factory UV-cured applied finish as, "No-Wax-Just clean and rinse"
 - b. Basis-of-Design Product: Gerflor Evercare®
9. Field-Applied Finishes: None required and not allowed.
10. Roll Size:
 - a. Roll Width: Rolls to be a minimum width of 6'6" wide.
 - b. Roll Length: rolls to be a minimum length of 66 feet.
11. Color and Pattern:
 - a. As selected by Owner from manufacturer's standard colors and patterns.

D. Performance Criteria:

1. ASTM F1913 for vinyl sheet floor covering without backing
 - a. Provide test certificate to show compliance with ASTM F1913.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based moisture insensitive formulation approved by the flooring manufacturer.
- B. Adhesives: Water-resistant type recommended by flooring manufacturer for substrate and conditions indicated.
 - a. Basis-of-Design Product: Gerflor Gerfix TPS+, Gerflor Spray Adhesive, Gerfix 196, T-111.
 - b. Coverage Type: Full-spread or full-surface application.
 - c. Adhesives available for "No Down Time" / Immediate Traffic Installations.
 - d. Adhesive available for 98% RH Slab Moisture Installations.
- C. Heat Welding Rod: As supplied by indoor flooring manufacturer. Color shall blend with resilient flooring color.

SECTION 09 67 23 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Acrylic or Epoxy resin liquid-applied flooring with embedded colored chips or flakes.

- B. Related Section:

- 1. Division 03 Section "Cast-in-Place Concrete" for concrete conditions, limitations, and requirements prior to installing resinous flooring. Concrete curing and the use of concrete curing compounds shall be in accordance with flooring manufacturer's requirements and recommendations. A properly installed vapor retarder shall be installed underneath the on-grade concrete floor slabs

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical data application instructions and general recommendations for resinous floor coating specified herein.
- B. Samples for Initial Selection: Color plates showing the full range of colors and patterns available for each floor coating type indicated.
- C. Samples for Verification: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- C. Material Certificates: Signed by manufacturer certifying that the decorative flake floor coating complies with all regulatory and any requirements specified herein.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.
- B. Material Certificates: Signed by manufacturer certifying that the decorative flake floor coating complies with all regulatory and any requirements specified herein

1.6 MAINTENANCE SUBMITTALS

- A. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of decorative resinous flooring and related materials.
- B. Installer Qualifications: The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
- C. Health Safety: System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department. System shall be in compliance with the Indoor Air Quality requirements of California section 01350 as verified by a qualified independent testing laboratory.
- D. Pre-installation Conference: Conduct conference at Project Site.
 - 1. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name, directions for storage and mixing with other components.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Comply with manufacturer's storage recommendations.
- C. Lighting: Permanent lighting shall be in place and working before installing resinous floor coating.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation. Application may proceed while air, material and substrate temperatures are between 35 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
- B. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
- C. The Applicator shall ensure that adequate ventilation is available for the work area. This shall include the use of manufacturer's approved fans, smooth bore tubing and closure of the work area.
- D. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- E. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of twenty eight days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
- F. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
- G. Sealers and curing agents should not to be used.
- H. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible de-lamination of the system.
- I. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
- J. "No Smoking" signs shall be posted at the entrances to the work area.
- K. The Owner shall be responsible for the removal of foodstuffs from the work area.
- L. Non-related personnel in the work area shall be kept to a minimum.

1.10 WARRANTY

- A. Provide manufacturer's standard warranty documents that fully explain warranty terms, limitations, and duration.

PART 2 - PRODUCTS

2.1 Provide one of the following Systems offered by the following manufacturer's.

2.2 DECORATIVE FLAKE POLYMERIC FLOOR COATING (Option No. 1)

A. Materials: Available Products: Subject to compliance with requirements, provide one of the following:

1. Decorative flake polymeric floor coating shall be Dex-O-Tex Colorflake L as manufactured by Crossfield Products Corp. in Rancho Dominguez, California and Roselle Park, New Jersey.
2. BASIS OF DESIGN: Garage Fx primers and Garage Fx ultra-high solids Polyaspartic for the topcoat. The flake blend color shall be Orbit.
3. Approved: Dur-A-Flex, Hybri-Flex.
4. Approved Installers: Bret Hargroder with Stone Wall Architectural and John Schexnaildre with Garage Experts of Baton Rouge – No exceptions.

B. Properties:

1. Colors: as indicated, or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, which must include white and off-white.
2. Physical Properties: Provide floor coatings system that meets or exceeds the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.
 - a. Thickness 15 – 21 mils:
 - b. Pencil Hardness (ASTM D3363) 3H
 - c. Impact Resistance (ASTM D2794) Direct 50 in. lbs. Reverse 10 in lbs.
 - d. Thermal Shock (ASTM D1211) Complies
 - e. Flexibility (ASTM D1737) 180° Bend (½" Mandrel) Passes
 - f. Chemical Resistance (ASTM D1308)
 - 1) Gasoline No Effect
 - 2) Kerosene No Effect
 - 3) Skydrol No Effect
 - 4) Isopropyl Alcohol No Effect
 - 5) Toluene No Effect
 - 6) Hydrogen Peroxide No Effect
 - 7) Hydrochloric Acid (25%) No Effect

2.3 DECORATIVE FLAKE MMA-BASED FLOOR COATING (Option No. 2)

A. Materials: Available Products: Subject to compliance with requirements, provide one of the following:

1. Decorative flake MMA-Based seamless acrylic flooring system shall be Dur-A-Flex, Inc, Cryl-A-Chip SL, flooring system.

B. Properties:

1. Colors: as indicated, or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, which must include white and off-white.
2. Physical Properties: Provide floor coatings system that meets or exceeds the listed minimum physical property requirements when tested according to the referenced standard test method indicated.

a.	Primer	Cryl-A-Prime P-101	
1)	Percent reactive resin	100 %	
2)	VOC	<100 g/L	
3)	Water absorption ASTM D570	0.04 %	
4)	Tensile strength, ASTM D638	3,550 psi	
5)	Tensile modulus ASTM D638	400,000 psi	
6)	Coefficient of thermal expansion ASTM D696		0.000035 in/in/F
7)	Electrical resistivity ASTM D257 Volume resistance, Surface resistance		1015 ohm-cm 1012 ohm
8)	Pot Life @ 68 F	10-20 minutes	
9)	Cure Rate @ 68 F	45-60 minutes	
10)	Recoat Time @ 68 F	45-60 minutes	
11)	Multi-coat application, solution weld	yes	
b.	Self-Leveling	Cryl-A-Glaze G-201 SL	
1)	Percent Reactive,	100 %	
2)	VOC	<100 g/L	
3)	Water absorption ASTM D570	0.04 %	
4)	Compressive Strength, ASTM C 109	8,000 psi	
5)	Tensile Strength, ASTM D 638 ASTM C 307	2,000 psi	
6)	Flexural Strength, ASTM D 790 ASTM C 580	3,700 psi 2,700 psi	
7)	Flexural Modulus, ASTM D 790	4.7x10 ⁵ psi	
8)	Electrical resistivity ASTM D257 Volume resistance, Surface resistance		1015 ohm-cm 1012 ohm
9)	Pot Life @ 68 F	10-20 minutes	
10)	Cure Rate @ 68 F	45-60 minutes	
11)	Recoat Time @ 68 F	45-60 minutes	
12)	Multi-coat application, solution weld	yes	
c.	Topcoat	Cryl-A-Top T-301	
1)	Percent Reactive Resin,	100 %	
2)	VOC	<100 g/L	

3)	Water absorption ASTM D570	0.4 %	
4)	Tensile Strength, ASTM D 638	3,550 psi	
5)	Tensile Modulus, ASTM D 638	300,000 psi	
6)	Coefficient of thermal expansion ASTM D638		0.000035 in/in/F
7)	Electrical resistivity ASTM D257 Volume resistance, Surface resistance		1015 ohm-cm 1012 ohm
8)	Water vapor transmission	10-20 minutes	DIN 53122
9)	Pot Life @ 68 F	10-15 minutes	
10)	Cure Rate @ 68 F	45-60 minutes	
11)	Recoat Time @ 68 F	45-60 minutes	
12)	Multi-coat application, solution weld	yes	

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, bond test, installation tolerances and other conditions affecting flooring performance.
 - 1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General:
 - 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
 - 2. Bond Test: Random tests for adequate bond strength shall be conducted on the sub-strate while the surface preparation is ongoing and prior to application of the primer, in accordance with the Manufacturer's recommendations.
 - a. A minimum frequency of three tests per 5000 sf. Smaller areas shall receive a mini-mum of three tests.
 - b. Based on the test results, additional substrate preparation may be required before proceeding with the installation of the system.
 - 3. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 85% relative humidity level measurement..
 - b. If the relative humidity exceeds 85% then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation sys-tem that has been approved by the manufacturer or other means to lower the value to the acceptable limit.

4. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
5. Mechanical surface preparation:
 - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum CSP of 3.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
 - d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired.
6. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General:

1. The system shall be applied in five distinct steps as listed below:
 - a. Substrate preparation, Bond Tests.
 - b. Priming
 - c. Topping/overlay application with decorative chip broadcast, brush chip with floor machine.
 - d. Topcoat application, sand floor (if required).
 - e. Second topcoat application
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer

1. The Primer shall consist of one roller applied coat with a coverage rate of 80-100 sq ft/gal or as recommended by manufacturer.
2. All components shall be measured and mixed in accordance with the Manufacturer's recommendations.
3. The primer shall cure tack-free before application of the floor topping.
4. Porous concrete may require a second coat of primer should the first coat be absorbed.

C. Topping

1. The topping shall be applied as a self-leveling system as specified. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
2. The topping shall be comprised of three components, a resin and filler together with a hardener powder that is to be added in accordance with the Manufacturer's recommendations.
3. The hardener powder shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. Filler Blend shall then be added to the catalyzed mixture and dispersed in the same manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal cured primed surfaces using gage rakes, trowels or other systems approved by the Manufacturer.
5. Immediately upon raking and/or trowel into place, the topping shall be degassed with a porcupine roller.
6. Decorative chips shall be broadcast into the wet material, Macro chip at the rate of 0.1 lbs/sf and Micro chips at the rate of 0.15 lbs/sf or as recommended by Manufacturer.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.
8. Brush chips with a floor machine with a medium stiffness brush; vacuum, sweep and/or blow to remove all loose chips.

D. Topcoat

1. The first roller applied topcoat shall have a coverage rate of 90-100 sq ft/gal or as recommended by Manufacturer.
2. The first topcoat coat will be allowed to cure then can be sanded or scraped to give desired finish texture.
3. The second topcoat is applied at a coverage rate of 90-100 sq ft/gal or as recommended by Manufacturer.
4. The finish floor will have a nominal thickness of 3/16 inch.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection.

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 - 1) Air, substrate temperatures and, if applicable, dew point.
 - b. Bond Test of the primer to the substrate shall be checked as per Clause 3.2, A, 2.
 - c. Coverage Rates
 - 1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 09 67 23

3)	Water absorption ASTM D570	0.4 %		
4)	Tensile Strength, ASTM D 638	3,550 psi		
5)	Tensile Modulus, ASTM D 638	300,000 psi		
6)	Coefficient of thermal expansion			
			ASTM D638	
7)	Electrical resistivity ASTM D257			
			Volume resistance,	1015
			Surface resistance	1012
8)	Water vapor transmission	10-20 minutes		
			DIN 53122	
9)	Pot Life @ 68 F	10-15 minutes		
10)	Cure Rate @ 68 F	45-60 minutes		
11)	Recoat Time @ 68 F	45-60 minutes		
12)	Multi-coat application, solution weld	yes		

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, bond test, installation tolerances and other conditions affecting flooring performance.
 1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General:
 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
 2. Bond Test: Random tests for adequate bond strength shall be conducted on the sub-strate while the surface preparation is ongoing and prior to application of the primer, in accordance with the Manufacturer's recommendations.
 - a. A minimum frequency of three tests per 5000 sf. Smaller areas shall receive a mini-mum of three tests.
 - b. Based on the test results, additional substrate preparation may be required before proceeding with the installation of the system.
 3. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 85% relative humidity level measurement..
 - b. If the relative humidity exceeds 85% then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation sys-tem that has been approved by the manufacturer or other means to lower the value to the acceptable limit.

4. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
5. Mechanical surface preparation:
 - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum CSP of 3.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
 - d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired.
6. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General:

1. The system shall be applied in five distinct steps as listed below:
 - a. Substrate preparation, Bond Tests.
 - b. Priming
 - c. Topping/overlay application with decorative chip broadcast, brush chip with floor machine.
 - d. Topcoat application, sand floor (if required).
 - e. Second topcoat application
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer

1. The Primer shall consist of one roller applied coat with a coverage rate of 80-100 sq ft/gal or as recommended by manufacturer.
2. All components shall be measured and mixed in accordance with the Manufacturer's recommendations.
3. The primer shall cure tack-free before application of the floor topping.
4. Porous concrete may require a second coat of primer should the first coat be absorbed.

C. Topping

1. The topping shall be applied as a self-leveling system as specified. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
2. The topping shall be comprised of three components, a resin and filler together with a hardener powder that is to be added in accordance with the Manufacturer's recommendations.
3. The hardener powder shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. Filler Blend shall then be added to the catalyzed mixture and dispersed in the same manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal cured primed surfaces using gage rakes, trowels or other systems approved by the Manufacturer.
5. Immediately upon raking and/or trowel into place, the topping shall be degassed with a porcupine roller.
6. Decorative chips shall be broadcast into the wet material, Macro chip at the rate of 0.1 lbs/sf and Micro chips at the rate of 0.15 lbs/sf or as recommended by Manufacturer.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.
8. Brush chips with a floor machine with a medium stiffness brush; vacuum, sweep and/or blow to remove all loose chips.

D. Topcoat

1. The first roller applied topcoat shall have a coverage rate of 90-100 sq ft/gal or as recommended by Manufacturer.
2. The first topcoat coat will be allowed to cure then can be sanded or scraped to give desired finish texture.
3. The second topcoat is applied at a coverage rate of 90-100 sq ft/gal or as recommended by Manufacturer.
4. The finish floor will have a nominal thickness of 3/16 inch.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection.

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 - 1) Air, substrate temperatures and, if applicable, dew point.
 - b. Bond Test of the primer to the substrate shall be checked as per Clause 3.2, A, 2.
 - c. Coverage Rates
 - 1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 09 67 23

SECTION 09 68 13 – TILE CARPETING

GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes carpet tile and installation.
- B. Related Sections include the following:
 - 1. Division 9 Section "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge Stripping and Accessory: 12-inch long Samples.
- C. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- D. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 1. Include the following:
- E.
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range and moisture content recommended by carpet tile manufacturer. Provide manufacturer recommended bond and moisture testing and test reports.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with

requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

C.

1. Warranty Period: 15 years (non-prorated) from date of Substantial Completion.
- 2.
- 3.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to 2.5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 – PRODUCTS

2. 2.1 PRODUCT SPECIFICATIONS

- A. Acceptable Manufacturers
1. J+J (basis of Design) – See finish schedule
 2. EF Contract
- B. Style
1. See Design Selection Summary in Construction Documents
- C. Backing
1. Kinetex

D. 2.3 MISCELLANEOUS PRODUCTS:

- A. Provide Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated to achieve a level floor and prevent “creeping” of floor patterns.
- B. Apply leveling compound to ease and flush out with all transitional floor areas scheduled to abut dissimilar floor materials of different thickness. Top of abutting dissimilar floor materials shall be flush and level.

- C. Adhesives: Water-resistant type approved waterproof spray on adhesive, recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
1. Kinetex Adhesive, Manufacturer's standard adhesive where slab moisture will permit.
 2. Spray Lock 9500 VCT flooring Adhesive. For concrete floors with RH levels above 95%. Follow manufacturer's installation guidelines. **In the event Kinetex Adhesive fails to bond carpet materials to the existing concrete slab, Spray Lock 9500 will be provided at no additional cost to the owner**

3.1 EXAMINATION

- D.
- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Test and verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
- C.
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
 4. Subfloor finishes comply with requirements specified in Division 3 Section "Hydraulic Cement Based Underlayment"
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E.

3.2 PREPARATION

- 1.9 3.3 INSTALLATION

- ## 1.10 3.4 CLEANING AND PROTECTION

- A. A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.

2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.
- D.

END OF SECTION 096813

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Fiber-cement board.
 - 3. Clay masonry.
 - 4. Concrete masonry units (CMUs).
 - 5. Steel and iron.
 - 6. Galvanized metal.
 - 7. Wood. (Painted and Stained)
 - 8. Traffic Stripping
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" Section 051213 "Architecturally Exposed Structural Steel Framing" for shop priming of metal substrates.
 - 2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 4. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
 - 5. Section 055213 "Pipe and Tube Railings" for shop painting pipe and tube railings.
 - 6. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.
 - 7. Opaque priming and painting of wood, composite trim and siding.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 unopened gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.

- a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
5. Inspection between coats: Before all coats are applied, contractor must have Architect and Owner inspect the previous coat before the next coat is applied. Failure to do so will automatically add another coat.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures, less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 2.2 *At any locations receiving vinyl graphics, the painter shall prep the wall with Kilz, so the vinyl graphic adheres properly. Tape off the designated area from surrounding paint.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: ***Benjamin Moore & Co is basis of Design.***
 1. Benjamin Moore & Co.
 2. PPG Architectural Coatings.
 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.3 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.
 - 1. Twenty percent of surface area will be painted with deep tones.

2.4 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Portland Cement Plaster: 12 percent.

- 6. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.

- d. Pipe hangers and supports.
- e. Metal conduit.
- f. Plastic conduit.
- g. Exposed Ductwork and Hangers
- h. Sprinkler Pipe.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Latex System:
 - a. Prime Coat: Primer, alkali resistant, water based.
 - 1) Benjamin Moore Ultra Spec Masonry Sealer 608
 - b. Prime Coat: Latex, exterior, matching topcoat.
 - c. Intermediate Coat: Latex, exterior, matching topcoat.
 - d. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).

- 1) Benjamin Moore Ultra Spec Exterior Satin N448

B. Cement Board Substrates:

1. Latex
 - a. Prime Coat: Primer, alkali resistant, water based.
 - 1) Benjamin Moore Multi-Purpose Primer 067
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5).
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448

C. Clay Masonry Substrates:

1. Latex System:
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - 1) Benjamin Moore Ultra Spec Masonry Sealer 608
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448

D. CMU Substrates: (After one coat of block filler, notify the architect. Block will be examined for areas that need pointing/divets filled before next coat is applied.) All dumpster enclosures and mechanical rooms shall be painted.

1. Latex System:
 - a. Prime Coat: Block filler, latex, interior/exterior.
 - 1) Benjamin Moore Ultra Spec Hi-Build Masonry Block Filler 571
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448

E. Steel and Iron Substrates:

1. Alkyd System:

- a. Prime Coat: Primer, alkyd, anticorrosive, for metal.
 - 1) Benjamin Moore Corotech Prep All Universal Metal Primer V132
- b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
- c. Topcoat: Alkyd, exterior, gloss
 - 1) Benjamin Moore Super Spec HP Urethane Alkyd Gloss P22

F. Galvanized-Metal Substrates:

1. Latex

- a. Prime Coat: Primer, galvanized,
 - 1) Benjamin Moore Ultra Spec HP Acrylic Metal Primer HP04
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, satin
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448

G. Wood Substrates: Glued-laminated construction.

1. Latex over Alkyd Primer System:

- a. Prime Coat: Primer, alkyd for exterior wood.
 - 1) Benjamin Moore Fresh Start Exterior Wood Primer 094
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448

H. Wood Substrates: Exposed framing.

1. Latex over Alkyd Primer System:

- a. Prime Coat: Primer, alkyd for exterior wood.
 - 1) Benjamin Moore Fresh Start Exterior Wood Primer 094
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).

1) Benjamin Moore Ultra Spec Exterior Satin N448

I. Wood Substrates: Wood trim, Architectural woodwork, Doors Windows, Wood board siding and wood fences.

1. Alkyd/Latex System:

a. Prime Coat: Primer, alkyd for exterior wood.

1) Benjamin Moore Fresh Start Exterior Wood Primer 094

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5).

1) Benjamin Moore Ultra Spec Exterior Satin N448

J. Wood Substrates: Wood-based panel products.

1. Latex over Alkyd Primer System:

a. Prime Coat: Primer, alkyd for exterior wood.

1) Benjamin Moore Fresh Start Exterior Wood Primer 094

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5).

1) Benjamin Moore Ultra Spec Exterior Satin N448

K. Wood Substrates: Traffic surfaces, including lumber decking and stairs.

1. Latex Porch and Floor Paint over Alkyd Primer System:

a. Prime Coat: Primer, alkyd for exterior wood.

1) Benjamin Moore Fresh Start Exterior Wood Primer 094

b. Intermediate Coat: Latex floor paint, matching topcoat.

c. Topcoat: Latex floor paint, low gloss.

1) Benjamin Moore Floor & Patio Low Sheen N122

- d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

L. Plastic Trim Fabrication Substrates:

1. Latex System:

- a. Prime Coat: Primer, bonding, water based.
 - 1) Benjamin Moore Insl-x Stix Waterborne Bonding Primer SXA-110
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
 - 1) Benjamin Moore Ultra Spec Exterior Satin N448

M. Wood Exterior Stain (vertical) Semi-Transparent:

1. Latex System:

- a. One Coat
 - 1) Benjamin Moore Woodluxe Water-Based Stain+ Sealer Semi-Transparent 692

N. Traffic Striping: (*In Section 32 17 23*)

1. Latex System:

- a. 15 mils wet – 9.3 mils dry.
 - 1) Benjamin Moore Insl-x Latex Traffic Paint TP22/TP32

END OF SECTION 099113

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates, generally all interior surfaces that has no factory finish, (u.n.o.).
 - 1. Concrete (Seal floors in equipment rooms and exposed concrete on steel pan stairs).
 - 2. Concrete masonry units (CMUs). ***Epoxy paint in all corridors and open adjacent lobbies or rooms, gang toilet rooms and dining room.***
 - 3. Steel and iron, structure, handrails, guardrails, etc.
 - 4. Galvanized metal.
 - 5. Hollow Metal Doors and Frames
 - 6. A/C Supply and return grilles in walls.
 - 7. Wood.
 - 8. Wood Cabinets, (painted or stained inside and out)
 - 9. Plastic, (PVC plumbing exposed).
 - 10. Gypsum board.
 - 11. Plaster.
 - 12. ASJ insulation covering.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" Section 051213 "Architecturally Exposed Structural Steel Framing" for shop priming structural steel.
 - 2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
 - 4. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 5. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
 - 6. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.
 - 7. Section 099600 "High-Performance Coatings" for tile-like coatings.
 - 8. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 unopened gal. and 5 unopened gallons of major field colors of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
5. Inspection between coats: Before all coats are applied, contractor must have Architect and Owner inspect the previous coat before the next coat is applied. Failure to do so will automatically add another coat.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. * Any areas receiving vinyl wall graphics shall receive Kilz so the vinyl graphic bonds properly. Tape off these areas from surrounding paint.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: *Benjamin Moore & Co is basis of Design.*
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Coatings.
 - 3. Sherwin-Williams Company (The).
- C. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Thickness. Apply minimum millage recommended by manufacturer
- B. Colors: As selected by Architect from manufacturer's full range.

1. Thirty percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Fiber-Cement Board: 12 percent.
 3. Masonry (Clay and CMUs): 12 percent.
 4. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7/NACE No. 4.
 - 4. SSPC-SP 11.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Hollow Metal Doors and Frames: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following, touch up bare spots with same primer used by frame manufacturer. Apply 1 coat of same primer 3' up on vertical frame members and any horizontal frames 3' or below.
- I. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- J. Aluminum Substrates: Remove loose surface oxidation.
- K. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Spray Paint to match wall all A/C supply and return grilles on vertical surfaces with oil-based paint.

- i. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
3. ALL steel, visible, shall be painted. If its exposed, it gets painted. No questions asked.
4. All exposed ductwork shall be painted.
5. All exposed electrical conduit shall be painted.
6. All exposed decks shall be painted. The architect has the right to choose two different colors for structural metal deck and the structure supporting the deck.
7. All exposed gypsum board shall be painted.
8. The tops & bottoms of all doors, if not already finished in the factory, shall be painted.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates – Floor Sealers

1. Oil Based
 - a. One Coat
 - 1) Benjamin Moore Insl-x Tuffcrete CST 5100
- B. CMU Substrates:
 1. Latex Epoxy System at all corridors, Stairwells restrooms, kitchens, wet areas, toilet rooms.
 - a. Block Filler: Block filler, latex, interior/exterior.
 - 1) Benjamin Moore Ultra Spec Hi-Build Masonry Block Filler 571
 - b. Intermediate Coat: Epoxy Latex, interior, matching topcoat.
 - c. Topcoat: Epoxy Latex, interior, low lustre - Semi Gloss.
 - 1) Benjamin Moore HP Pre-Catalyzed Waterborne Epoxy Eggshell HP3420
 2. Latex Acrylic System at all other CMU areas to be painted.
 - a. Block Filler: Block filler, latex, interior/exterior.
 - 1) Benjamin Moore Ultra Spec Hi-Build Masonry Block Filler 571.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, eggshell.
 - 1) Benjamin Moore Super Hide Zero Eggshell 357
- C. Steel Substrates – Columns, beams, structural members:
 1. Alkyd System, Alkyd Primer & Topcoat:
 - a. Prime Coat: Primer, alkyd, quick dry, for
 - 1) Benjamin Moore Corotech Prep All Universal Metal Primer V132
 - b. Intermediate Coat: Same as Topcoat
 - c. Topcoat: Alkyd, interior semi-gloss
 - 1) Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793
 2. Latex over Shop-Applied Quick-Drying Shop Primer System, (above 10’):
 - a. Prime Coat: Primer, quick dry, for shop application. Re: Steel specs...
 - b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior
 - 1) Benjamin Moore Ultra Spec HP DTM HP29
- 3. Water-Based Dry-Fall System for metal roof decks: (Metal deck and structure supporting deck will be of different colors).
 - a. Prime Coat: Primer, quick dry, for metal.
 - 1) Benjamin Moore Ultra Spec HP Acrylic Metal Primer HP04
- D. Hollow Metal Doors and Frames.
 - a. Prime Coat: Primer, quick dry, for metal.
 - 1) Benjamin Moore Ultra Spec HP Acrylic Metal Primer HP04
 - b. Intermediate Coat: Same as Top Coat
 - c. Topcoat: Latex, interior semi-gloss
 - 1) Benjamin Moore Ultra Spec Scuff-X Interior Semi-Gloss 487
- E. Galvanized-Metal Substrates:
 - 1. Latex System:
 - a. Prime Coat: Primer, galvanized, cementitious.
 - 1) Benjamin Moore Ultra Spec HP Acrylic Metal Primer HP04
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior.
 - 1) Benjamin Moore Ultra Spec HP DTM Semi-Gloss HP29
 - 2. High-Performance Architectural Latex System (at areas below 10’):
 - a. Prime Coat: Primer, galvanized, water based.
 - 1) Benjamin Moore Ultra Spec HP Acrylic Metal Primer HP04
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss.
 - 1) Benjamin Moore HP Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP3410

3. Water-Based Dry-Fall System for galvanized duct work & galvanized exposed roof decks:
 - a. Prime Coat: Dry fall, water based, for galvanized steel, matching topcoat.
 - b. Topcoat: Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1).
 - 1) Benjamin Moore Latex Dry Flat 395
- F. Sealed Concrete Floors: Benjamin Moore Corotech High Performance Clear Acrylic Sealer V027
- G. Wood Substrates: Glued-laminated construction-painted.
 1. Alkyd System:
 - a. Prime Coat: Primer for interior wood.
 - 1) Benjamin Moore Fresh Start Undercoater and Primer/Sealer 032
 - b. Intermediate Coat: Alkyd, matching topcoat.
 - c. Topcoat: Alkyd.
 - 1) Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793
- H. Wood Substrates - Painted: Wood trim, Architectural woodwork, Doors Windows, and wood board paneling.
 1. Alkyd System:
 - a. Prime Coat: Primer for interior wood.
 - 1) Benjamin Moore Fresh Start Undercoater and Primer/Sealer 032
 - b. Intermediate Coat: Alkyd, matching topcoat.
 - c. Topcoat: Alkyd.
 - 1) Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793
- I. Stained Hard Wood – Alkyd Four Coat System:
 - a. Stain Coat:
 - 1) Old Masters Wiping Stain
 - b. Sander Sealer Coat: Alkyd, interior, matching paint manufacturer recommendation.
 - c. Intermediate Coat: Alkyd, interior, matching topcoat.
 - d. Topcoat: Alkyd, interior – Satin Finish.
 - 1) Old Masters Interior Oil Based Polyurethane Satin

J. Stained Soft Wood, (Cypress/Pine) – Alkyd Five Coat System:

- a. Pre-Sealer
 - 1) Old Masters Wood Conditioner
- b. Stain Coat:
 - 1) Old Masters Wiping Stain
- c. Sander Sealer Coat: Alkyd, interior, matching paint manufacturer recommendation.
- d. Intermediate Coat: Alkyd, interior, matching topcoat.
- e. Topcoat: Alkyd, interior – Satin Finish.
 - 1) Old Masters Interior Oil Based Polyurethane Satin

K. Gypsum Board and Plaster Substrates:

- 1. Latex over Latex Sealer System: (Walls eggshell, Fur downs and Ceilings Flat)
 - a. Prime Coat: Primer sealer, latex, interior.
 - 1) Benjamin Moore Drywall Primer 380
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior
 - 1) Benjamin Moore Super Hide Zero Eggshell 357 (355 Flat for Ceilings and Fur Downs)

END OF SECTION 099123

DIVISION 10 – SPECIALTIES

SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. All marker boards, tackboards and display rails by the same manufacturer throughout the project.
2. Any damaged boards shall be immediately rejected.

- B. Related Requirements:

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Include electrical characteristics for motorized units.

- B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
3. Show locations and layout of special-purpose graphics.
4. Include sections of typical trim members.
5. Include wiring diagrams for power and control wiring.

- C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

1. Samples of facings for each visual display panel type, indicating color and texture.
 2. Fabric swatches of fabric facings for tackboards.
 3. Actual factory-finish color samples, applied to aluminum wood substrate.
 4. Include accessory Samples to verify color selected.
- D. Samples for Verification: For each type of visual display unit indicated.
1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: 6-inch-long sections of each trim profile.
 3. Display Rail: 6-inch-long section of each type.
 4. Accessories: Full-size Sample of each type of accessory.
- E. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 1. Build mockup of typical visual display unit as shown on Drawings. Include accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY

- A. Manufacturers:
 - a) Claridge Products

- b) Seton
 - c) Moore Co, Inc
 - d) Or approved equals
- B. Visual Display Board Assembly: factory fabricated.
- 1. Assembly: markerboard and tackboard.
 - 2. Corners: Square.
 - 3. Width: As indicated on Drawings.
 - 4. Height: 48".
 - 5. Mounting Method: Direct to wall.
 - 6. SEE PLANS FOR SIZE AND LOCATIONS
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
- 1. Color: White.
- D. Tackboard Panel: Natural-cork tackboard panel on core indicated.
- E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape.
- 1. Aluminum Finish: Clear anodic finish.
- F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
- G. Combination Assemblies: Provide manufacturer's standard exposed trim between abutting sections of visual display panels.
- H. Chalktray: Manufacturer's standard; continuous.
- 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
- I. Display Rail: Manufacturer's standard, extruded-aluminum display rail with natural cork , ¼" thick, insert, end stops, and continuous paper holder, designed to hold accessories.
- 1. Size: 2 inches high by full length of visual display unit.
 - 2. Map Hooks: 4 map hooks for every 96" of display rail or fraction thereof.
 - 3. 2 roller brackets per wall
 - 4. Flag Holder: One for each room.
 - 5. Tackboard Insert Color: Natural Cork.
 - 6. Aluminum Color: Match finish of visual display assembly trim.
 - 7. End trim pieces. No exposed edges.
- J. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action. Display rail shall be cleaned at the end of the project from all dust and debris.
- K. Remove all plastic protective wrapping once the installation is deemed safe from construction damage.

2.4 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with high-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
 - 1. Face Sheet Thickness: 24 gauge uncoated base metal thickness.
 - 2. Core: Minimum 3/8" inch thick particleboard with .015" aluminum backing sheet. with manufacturer's standard moisture-barrier backing.

2.5 TACKBOARD PANELS

- A. Tackboard Panels:
 - 1. Facing: 1/4-inch-thick natural cork.
 - 2. Core: 1/4-inch-thick hardboard..
 - 3. Accessories: Top Rail with cork insert and four map hooks to match markerboards.

2.6 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. High-Pressure Plastic Laminate: NEMA LD 3.
- C. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- D. Hardboard: ANSI A135.4, tempered.
- E. Particleboard: ANSI A208.1, Grade M-1.
- F. Extruded Aluminum: ASTM B 221, Alloy 6063.
- G. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings,
- E. Display Rails: Install rails at mounting heights indicated on Drawings,

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 00

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes toilet compartments and screens as follows:
 - 1. Type: Solid plastic, phenolic core.
 - 2. Compartment Style: Overhead braced and floor anchored.

1.3 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment mounted toilet accessories.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures and patterns available for each type of compartment or screen indicated.
- D. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch square. Samples of same thickness and material indicated for Work.

1.4 QUALITY ASSURANCE

- A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 PHENOLIC-CORE UNITS

1. Columbia Partitions Super HD-8433-BR, by Partition Systems, Inc., P.O. Box 1118, Columbia, S.C. 29202
Other Manufacturers that may be submitted for prior approval include:
 - A. American Sanitary Partition Corp.
 - B. Columbia Partitions
2. Hardware and fasteners: Cast Stainless steel (**no cast aluminum or "Zamac"**) with theft proof heads.
3. General: Provide material which has been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Solid Phenolic shall meet or exceed all requirements for Class "A" Flame Spread Rating calculated according to ASTM E-84-91A, and shall carry a UL Class "A" Fire Rating Certification.
4. Material shall be Solid Phenolic with a High Pressure Melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable.
 - a. Doors – Minimum .75" (19 mm) Finished Thickness
 - b. Divider Panels – Minimum .5" at toilets (19mm) Finished Thickness
 - c. Divider Panels @ Showers. .75" (19 mm) Finished Thickness
 - d. Shower side panels at Rooms 208A, 212A, & 225A shall be full length, 6'-8" high. Provide same ht. pilaster to receive curtain. Provide overhead rail for curtain.
 - e. Pilasters – Minimum .75" (19 mm) Finished Thickness
 - d. Pilasters at showers: Provide 6" wide x 6' 8" tall to receive a continuous overhead aluminum head rail.
5. Colors: From Standard Selection.
6. Pilaster Shoes: ASTM A 167, Type 302/304 Stainless Steel, minimum 4" high, 18 gauge, finished with #3 Directional Polish, attached with Stainless Steel Through Bolts.
7. Continuous Wall & Pilaster Brackets: Full High (57.5") Extruded 6063-T5 Aluminum with a Satin Anodized finish. The minimum weight shall be 1.685 pounds per lineal foot. Inside of opening of Bracket shall be .50" & .75" for panels, .75" for pilasters. All holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 9" O.C. along the full length of the Bracket for a total of fourteen (14) holes for mounting to the wall and seven (7) holes for mounting to the panel/pilaster. Each Bracket is to have minimum wall thickness of .125". Each Bracket is to be packaged in a separate poly tube, and is to be labeled by stock number and manufacturer.
- 7a. Continuous Urinal partition end channels. 1-1/4" sq. x 1/8" thick aluminum tube with top and bottom receiver brackets.
8. Continuous Hinge: Continuous 14 Gauge Stainless Steel Hinge (57.5"). Hinge shall be 3" wide and shall have five (5) Stainless Steel wire springs for self-closing action. Pivot pin shall be .250" in diameter, and shall be made of Type 302/304 Stainless Steel. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door and pilaster. Mounting holes shall be at 9" O.C. for Through-Bolting with Stainless Steel fasteners. Each Hinge is to be packaged in a separate poly tube, and is to be labeled by stock number, manufacturer, and left or right hand.
9. Emergency Access Strike and Keeper: Heavy Duty Cast Stainless Steel with a Satin finish. The Strike and Keeper shall be 2.50" high, with the mounting holes at 1.50" O.C., and the wall thickness shall be a minimum of .125". The Strike and Keeper shall have a slot, .80" X .29" on the top and bottom of the Strike and Keeper, to

receive the Slide Latch Bar and to allow for emergency access by lifting the door. The Strike and Keeper shall have an integral rubber bumper door stop. The stock number shall be molded into the back of the Strike and Keeper for ease in identification. Each Strike and Keeper shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.

10. Slide Latch: Heavy Duty Cast Stainless Steel with a Satin finish. The Slide Latch shall be surface mounted. The slide bar shall be .150" thick, 1.020" wide and 3.720" long. Latch shall have an internal Stainless Steel buffering spring to prevent damage when door is inadvertently slammed against the Latch. Mounting holes are to be spaced at 3.50" O.C. Latch knob is to be riveted to the slide bar and then welded to insure that the knob will not come off. The stock number is to be molded into the back of the Slide Latch for ease in identification. Each Slide Latch shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.

11. Coat Hook: Heavy Duty Cast Stainless Steel with a Satin finish. Coat Hook and Bumper shall be 2.340" high, 1.230" wide and shall protrude out from the door 3.05". The hook portion shall have a finished diameter of .250". The stock number shall be molded into the back of the Coat Hook and Bumper for ease in identification. Each Coat Hook and Bumper shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door and one per shower.

12. Door Stop: Heavy Duty Cast Stainless Steel with a Satin finish. Plated Zamac Door Stops are not approved. Door Stop shall have a 2.125" base diameter and shall protrude 1.80" from the wall. The bumper at the end of the Door Stop shall be .250" thick. The diameter of the shaft shall be .6875". The stock number shall be molded into the back of the Door Stop for ease in identification. Each Door Stop shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one for each Disabled Accessible door.

13. Pull Handle: Heavy Duty Cast Stainless Steel with a Satin finish. Plated Zamac Door Pulls are unacceptable. Pull Handle shall protrude from the face of the door .940" and shall be 4.735" long. The Pull Handle shall have mounting holes drilled and tapped for 10/24 threads at 3.50" O.C. The Pull Handle shall be .655" wide and shall be mounted back to back with the Slide Latch. The stock number shall be molded into the back of the Pull Handle for ease in identification. Each Pull Handle shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one for each Disabled Accessible door.

14. Overhead Bracing (Headrail): Continuous Heavy Duty Extruded 6063-T5 Aluminum Headrail with Anti-Grip profile. Headrail shall have integral reinforcing channel and curtain track. Headrail shall have a Satin Anodized finish. At showers, provide head rail from front pilaster back to cmu wall over each partition. Provide Headrail Corner Brackets, Wall Brackets, and Headrail End Caps as required. The Headrail and Headrail Brackets shall have a minimum wall height of 2". The minimum wall thickness of the Headrail and Headrail Brackets shall be .125". Each Headrail Bracket is to be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer.

15. Anchorages and Fasteners: All Fasteners shall be Chrome Plated Brass or stainless steel with theft proof heads, Through-Bolted sex bolts unless noted otherwise. No chrome plated steel will be acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. THE TOILET COMPARTMENT DOORS SHOULD REST AT A 45 DEGREE ANGLE (OPENED) TO INDICATE THEY ARE NOT IN USE. THIS WILL BE CHECKED IN THE PUNCH LIST PHASE AND FAILURE TO ADJUST WILL RESULT IN REMOVING AND REINSTALLING PROPERLY.**

- B. THE DOORS MUST OPEN AND CLOSE GENTLY, NO SLAMMING DUE TO OVERTENSIONED SPRINGS. THIS WILL BE CHECKED IN THE PUNCH LIST PHASE.**
- C. DOORS WILL BE CHECKED DURING THE PUNCHLIST FOR CORRECT EMERGENCY LIFT OPERATION. ANY DOORS NOT ABLE TO BE OPENED WITH THE EMERGENCY LIFT PROCEDURE WILL BE REJECTED, IF HOLES IN EITHER PILASTER OR DOOR PANEL DO NOT ALIGN WITH CORRECT LOCATION FOR EMERGENCY LIFT PROCEDURE THE PANEL WILL BE REPLACED WITH NEW PANELS AT THE CONTRACTOR'S SOLE EXPENSE, NO EXCEPTIONS**
- D. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Installation tolerances:
 - a. Maximum variation from plumb: 1/8 inch.
 - b. Maximum displacement from indicated position: 1/8 inch.
- E. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION 10155

SECTION 10 26 50 - IMPACT-RESISTANT WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Stainless Steel Corner guards.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - 2. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.

1.4 ACTION SUBMITTALS

- A. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
 - 1. Include similar Samples of accent strips and accessories involving color selection.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Wall Guards: 12 inches (300 mm) long. Include examples of joinery, corners, and field splices.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 1 Section "Quality Requirements."
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
 2. Keep plastic sheet material out of direct sunlight.
 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
 - a. Store corner-guard covers in a vertical position.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:

- a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M.

2.2 CORNER GUARDS

- A. **Each Gypsum Board corner shown on the floor plan shall receive a corner guard, no exceptions, product as follows:**
- B. **Surface-Mounted, Stainless Steel Metal Corner Guards: Fabricated from one-piece,** formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Floor Products Co., Inc.
 - b. Arden Architectural Specialties, Inc.
 - c. Balco, Inc.
 - d. Boston Retail Products.
 - e. Construction Specialties, Inc.
 - f. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - g. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - h. Pawling Corporation.
 - i. Tepromark International, Inc.
 - j. WallGuard.com.
 3. Material: Stainless steel, Type 304.
 - a. Thickness: Minimum **16 gauge**
 - b. Finish: Directional satin, No. 4.
 4. Wing Size: Nominal **3-1/2 by 3-1/2 inches (90 by 90 mm)**.
 5. Corner Radius: **1/8 inch (3 mm)**.
 6. Height: 4' at typical at **all** outside corners of gypsum board finish walls.
 7. Mounting: Oval head, countersunk screws through factory-drilled mounting holes each side max. 3' o.c. ea. side.
- C. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 1. Remove tool and die marks and stretch lines, or blend into finish.

2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
 3. Run grain of directional finishes with long dimension of each piece.
 4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- D. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 1. Install impact-resistant corner protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:
 - a. Stainless Steel Corner Guards: 4" above finished floor, 4' tall.
 - b. INSTALL ABOVE FLOOR BASE

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102650

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Private-use bathroom accessories.
 - 2. **Under-lavatory guards.**
- B. Related Requirements:
 - 1. none

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.

2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS (contractor installed)

- A. Owner-Furnished Materials:
 1. none

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Grab Bar at each HC toilet:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 2. Mounting: Flanges with concealed fasteners.

3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 4. Outside Diameter: 1-1/2 inches.
 5. Configuration and Length: Straight, 36 & 42 inches long.
- C. Mirror Unit
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 2. Frame:
 - a. Stainless-steel channel at non HC lavatories
 - b. Stainless steel, fixed tilt at HC lavatories, (individual toilets and 1 per gang toilet.
 - c. Corners: Welded and ground smooth.
 3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
 4. Size:
See plans for location – Size 24”w X 36”h – unless the unit shown on the plans and schedules is larger. Otherwise minimum size is 24”x36”
- D. Warranty: 10 years against silver spoilage on mirrors.
- E. Waste Receptacle: See plans for schedule
- F. Sanitary Napkin Disposal
- a. Bobrick B-270 (basis of design)
 - b. Bradley (equal)
 - c. ASI (equal)
- G. Toilet Paper Dispenser
- a. Owner provided contractor installed
- H. Soap Dispenser
- a. Owner provided contractor installed
- I. Paper Towel Dispenser
- a. Bobrick 3940 (basis of design)
 - b. Bradley (equal)
 - c. Asi (equal)

- J. See plans for schedule of all toilet room accessories to be provided in this project.

2.4 UNDERLAVATORY GUARDS

A. Underlavatory Guard on per lav with exposed P-Trap

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Truebro by IPS Corporation. #101-G or prior approved equal.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Mop and Broom Holder

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Basis of Design Bobrick B-223x36 , one at each janitor closet and utility closet with sink.
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
 - b. Rod: Approximately 1/4-inch-diameter stainless steel.
7. Location: Janitor closet and Utility closet.

C. Mop Sink Surround

- a. Provide stainless steel wall splash protection at each floor mop sink.
- b. 22 gauge type 304 stainless steel plate.
- c. Full width of mop sink and 48" in height.

2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- C. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 42 00 – CAST PLAQUES

1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Cast metal plaques.

1.2 QUALITY ASSURANCE

- A. **Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.**
- B. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.
- D. **Sign supplier to provide ONLINE REORDER website for use by owner to order additional signs. Reorder website to include sign descriptions, sign drawings & sign cost.**

1.3 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples for initial selection: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- E. Samples for Verification: For each type of sign, include the following samples to verify color and finish selected:
 - 1. Actual sample of casting in metal specified to show finish, texture & lettering style.
- F. Installation: Submit supplier's installation instructions.
- G. Closeout Submittals:
 - 1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
4. Handle products in accordance with manufacturer's instructions.

1.5 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 1. Warranty Period: One year from date of substantial completion.

2 PRODUCTS

2.1 SIGNAGE SYSTEMS

- A. The following manufacturer and product is used as a basis of design and are Prior Approved:
 1. ASI Signage Innovations, 1101 24th Street Kenner, Louisiana 70062-5266; (504) 704 1000 telephone; (504) 704 1006 facsimile. Contact: Kristen Landry (504) 554-1561.
 2. Acceptable Product: ASI Cast Plaque
 3. Other manufacturers shall submit an equivalent style signage system 10 days prior to advertised bid before Approval is issued. The equivalency shall be the sole discretion of the architect.

2.2 FABRICATION

- A. General: Cast free from pits, gas holes, and warped surfaces.
- B. Cast Plaque:
 1. Quantity: 1
 2. Material: Bronze
 3. Size: 24"h x 30" w.
 4. Border: Selected from manufacturer's standard.
 5. Letter Style: Manufacturers Standard
 6. Mounting: Blind stud mount
 7. Artwork and Copy: Allow 1 letter per 1 sq inch of plaque area.
 8. Finishes:
 - a) Background: Painted, color to be selected.
 - b) Borders: Beveled.
 - c) Texture: Pebbled.

3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of installation by Owner or it's representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

- 3.2 INSTALLATION – verify plaque location in field and provide all necessary blocking.
- A. Install product in accordance with supplier's instructions.
 - B. Provide all necessary blocking in wall for mounting of new and existing plaques. Verify location of plaques in field with architect.
 - C. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
 - D. Install product level, plumb, and at heights indicated.
 - E. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
 - F. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
 - 1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.
- 3.3 CLEANING, PROTECTION, AND REPAIR
- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 3 feet.
 - B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.
- 3.4 SIGN SCHEDULE
- A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

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SECTION 10421 – INTERIOR/EXTERIOR DIMENSIONAL LOGOS, LETTERS, WALL WRAPS – LEGACY SERIES, LF SERIES, LTV SERIES, LPP SERIES

1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Exterior logos and letters
 - 2. Interior logos and letters
 - 3. Digitally printed wall wraps

1.2 QUALITY ASSURANCE

- A. **Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.**
- B. APPROVED MANUFACTURERS:
 - 1. ASI SIGNAGE / Harahan, Louisiana
 - 2. Lettermans / Baton Rouge, Louisiana
- C. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- D. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

1.3 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples for initial selection: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- E. Samples for Verification: For each type of sign, include the following samples to verify color and finish selected:
 - 1. Full size sample of letter style and size required to show finish, texture and mounting method.
- F. Installation: Submit supplier's installation instructions.
- G. Closeout Submittals:
 - 1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
 - 2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
 - 4. Handle products in accordance with manufacturer's instructions.
 - 5. **Sign vendor to provide online reorder website to owner upon completion. Reorder website shall include order forms, sign drawings and cost per letter.**

1.5 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: One year from date of substantial completion. Warranty specifically excludes logo mounting substrate.

2 PRODUCTS

2.1 SIGNAGE SYSTEMS

- A. The following manufacturer and product is used as a basis of design and are Prior Approved:
 - 1. ASI Signage Innovations, 520 Commerce Point, Harahan, LA 70123;
(504) 704 1000 telephone
Contact: Kristen Landry, (504)-554-1561, Kristen.landry@asisignage.com

Acceptable Product : ASI Legacy Series , Light Weight Fabricated Metal Dimensional Logo, LF Series Fabricated Letters and LTV Series, Digitally Printed Vinyl Graphics.
Other manufacturers may submit an equivalent style signage system 10 days prior to advertised bid before Approval is issued. The equivalency shall be the sole discretion of the architect.

B. **Sheet A-703 / Detail E11 Lobby West**

- 1. "COHN ELEMENTARY" Non-Lit Fabricated Letters
 - a) ASI LF Series, Non-Lit Aluminum Letters
 - b) Size/Depth: 24" h x 2" deep
 - c) Font: Sans Serif Font TBD
 - d) Stud Mount
 - e) Finish: Painted (1) Standard Color
 - f) 3/4" Plywood Blocking req'd by GC at full extent of sign.

C. **Sheet A-200 / Detail M1 Building Elevation North**

- 1. "COHN ELEMENTARY" Non-Lit Fabricated Letters
 - a) ASI LF Series, Non-Lit Aluminum Letters
 - b) Size/Depth: 20" h x 2" deep
 - c) Font: Sans Serif Font TBD
 - d) Stud Mount
 - e) Finish: Painted (1) Standard Color
 - f) 3/4" Plywood Blocking req'd by GC at full extent of sign.

D. **Various Sheets Vinyl Graphics**

- 1. ASI LTV Series Digitally Printed Wall Graphics
 - 1) Sizes (Signage manufacturer to V.I.F.)

- A-701 / Detail E11 : 8' h x 12" w
 - A-703 / Detail E11: 10" h x 17" w
 - A-703 / Detail A11: 10" h x 17" w
 - A-704 / Detail E1: 10" h x 17" w
 - A-704 / Detail A1: 10" h x 17" w
- b) Heat Applied Film to Painted CMU with Protective Overlamine
 - c) Seams Every 4'
 - d) Artwork to Be Supplied by Signage Manufacturer w/ High Resolution Images and Logo Elements to be Supplied by Owner/Architect. In-person meeting(s) with entire project team to be scheduled to kick-off design process.
- E. Sheet A-704 / Detail A15 & E18**
- 1. ASI LPP Series Laser Cut Acrylic Letters
 - 2. Size/Depth: 12" h x 3/8" thick
 - 3. Font: Sans Serif TBD
 - 4. Finish: Painted (1) Standard Color
 - 5. Tape Mount
 - 6. To Read: QTY 2. each "BOYS" and "GIRLS"
- F. FOR THE CUSTOM GRAPHICS DESCRIBED IN ITEM 2, THE SIGNAGE COMPANY SHALL PROVIDE 20 WORKING HOURS WITH THE SIGNAGE COMPANY'S GRAPHIC DESIGNER TO MEET WITH THE OWNER TO DESIGN AND CREATE THE CUSTOM GRAPHIC IMAGES FOR USE ON DIGITALLY PRINTED WALL WRAPS. THIS WORK IS INCLUDED IN THE PROJECT AT NO ADDITIONAL COST.**

2.2 FABRICATION - GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
- C. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
- D. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
- E. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of installation by Owner or it's representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

- A. ALL WALLS RECEIVING VINYL WALL WRAPS SHALL RECEIVE A FINAL PAINT COAT OF KILZ OR ZINSSER PRIMER BEFORE INSTALLATION OF VINYL WALL WRAPS. VERIFY WITH VINYL WALL WRAP MANUFACTURER THAT THE CORRECT BACKING PAINT IS APPLIED FOR ADHERANCE OF VINYL WALL WRAP.
- B. Install product in accordance with supplier's instructions.
- C. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
- D. Install product level, plumb, and at heights indicated.
- E. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
- F. Install signs within the following tolerances and in accordance with manufacturer's recommendations:

1. Exterior Signs: Within 1 inch vertically and horizontally of intended location.

3.3 CLEANING, PROTECTION, AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 10 feet.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.4 SIGN SCHEDULE

- A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

SECTION 10 44 16 – Fire Extinguishers and Cabinets

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers in semi recessed cabinet (see locations on life safety plan) for exposed public areas, including but not limited to corridors, and large assembly rooms
 - 2. Type K (Kitchen) fire extinguishers – wall hung (see locations on life safety plan)
 - 3. Portable fire extinguishers on manufacturer provided wall hook (see locations on life safety plan) for utility spaces not intended for general public, including but not limited to, mechanical rooms, electrical rooms, data rooms.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers listed, and labeled by FM.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
 - 1. Portable Fire Extinguishers.
 - a. J. L. Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter Roemer; Div. of Smith Industries, Inc
 - 2. Fire-Protection Cabinets:
 - a. J. L. Industries, Inc.
 - b. Larsen's Manufacturing Company
 - c. Potter Roemer; Div. of Smith Industries, Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry-Chemical Type: UL rated 2-A; 10: B: C, 10-lb nominal capacity, in enameled container. (all mounted in cabinets – 4 thus)
- C. In the Breakroom, provide one (1) type K extinguishers, wall mounted. Basis of design: Buckeye 6 (1.6 gallon) liter class K wet chemical fire extinguisher, UL Rating 1-A:K.
- D. All extinguishers are to be tagged by the State of Louisiana.

2.4 FIRE-PROTECTION CABINETS

- A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
 - 1. Fire Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire resistance rating of wall where it is installed.
 - a. Construct fire rated cabinets with double walls fabricated from 0.0478 inch thick, cold rolled steel sheet lined with minimum 5/8 inch thick, fire barrier material.
 - b. Provide factory drilled mounting holes.
 - 2. Cabinet Metal: Enameled steel sheet.
- B. Cabinet Type: Suitable for the following:
 - 1. Fire extinguisher.
- C. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semi recessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
 - 2. Mount in CMU.
- D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Exposed Trim: One piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Rolled Edge Trim: 2-1/2 inch backbend depth.
- E. Cabinet Trim Material: Manufacturers standard, as follows:
 - 1. Anodized Aluminum.

- F. Door Material: Aluminum with narrow view panel of temp. glass., as follows:
 - 1. Anodized Aluminum.
- G. Door Style: Manufacturer's standard design with narrow temp. glass view panel:
- H. Door Construction: Fabricate doors according to manufacturer'
 - 1. Provide minimum ½ inch thick door frames, fabricated with tubular stiles and rails, and hollow metal design.
- I. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous type hinge permitting door to open 180 degrees.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils**.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 - 2. Fasten cabinets to structure, square and plumb.
 - 3. Mounting height: 56" to top of fire extinguisher cab.

3.3 ADJUSTING AND CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 44 16

SECTION 104420 – INTERIOR ROOM SIGNS

PART 1 GENERAL

.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Accessible Restroom Signage
 - 2. Exit Identification
 - 3. Room/Office Identification Signage

.2 QUALITY ASSURANCE

- A. **Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.**
- B. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.
- D. **Sign supplier to provide ONLINE REORDER website for use by owner to order additional signs. Reorder website to include sign descriptions, sign drawings & sign cost.**

.3 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- E. Installation: Submit supplier's installation instructions.
- F. Closeout Submittals:
 - 1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
4. Handle products in accordance with manufacturer's instructions.

.5 **WARRANTY**

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 1. Warranty Period: One year from product ship date.

PART 2 PRODUCTS

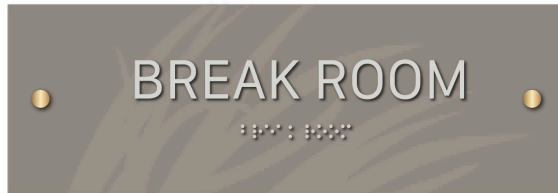
.1 **SIGNAGE SYSTEMS**

- A. Acceptable Manufacturers:
- B. The following manufacturer and products are used as a basis of design and are Prior Approved:
 1. ASI Signage Innovations, 520 Commerce Point, Harahan, LA 70123;
(504) 704 1000 telephone
Contact: Kristen Landry, (504)-554-1561, Kristen.landry@asisignage.com
 2. Acceptable Product: ASI InTouch III Unframed Plaques
 3. Additional manufacturers shall submit equal product data 10 days before advertised bid date for architect's review. The architect has sole discretion to accept or deny substitutions.

.2 **SIGN MATERIALS**

- A. Sign Face: High impact cast matte acrylic, 3D printed text and braille. Utilize direct to substrate UV-LED flatbed printer and silicon-based print head. UV-LED curable inks with full CMYK & white ink instantly cured for precise ADA compliance.
- B. Tactile Graphics and Text: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque surface using manufacturer's 3D printed process.
 1. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors. Text should have matte gloss level and square shoulders.
 2. Colors: Background color is second surface painted. Text Color is integrally colored and printed first surface with logo. Silkscreened text is not allowed.
 3. Cast acrylic sheet to be laser cut to shape after painting to allow for clear polished edges.
 4. First surface painted signs and sandblasted sign faces are not allowed.
- C. Sign Type Description

1. Face Depth: 1/4" thickness Clear Acrylic with Flat Polished Edges
2. Panel: 1/4" thick P95 Frosted Matte Clear Acrylic Panel.
3. Surface Texture: **Smooth Texture** with non glare finish.
4. Raised text, pattern and translucent backing is integrally colored and 3D printed into face background.
5. Text schedule: See schedule.
6. Corner Shape: Square
7. Quantity: See schedule.
8. Sign Types (typical)
 - a. Sign Type I- 8"h x 6"w Restrooms - mounted w/ (4) standoff/pucks
 - b. Sign Type II – 4"h x 6"w Exit – mounted w/ (2) standoff/pucks
 - c. Sign Type III – 4"h x 8"w Auxiliary Room – mounted w/ (2) standoff/pucks
 - d. Sign Type IV - 4" x 8" Office mounted w/ (2) standoff/pucks; Window for paper insert (insert provided by others)



.3 INSTALLATION METHOD

- A. Mounted with (2) or (4) 1/2" diam. pucks in champagne gold finish; 1/2" standoff
- B. Signs mounted on glass to have additional 1/4" thick painted backer to match sheetrock paint color, same size as sign. Backer will tape to glass. Adhere vinyl backer to back side of glass to conceal tape.

.4 FABRICATION - GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
- C. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.
- D. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
- E. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

PART 3 EXECUTION

.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

- B. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

.2 INSTALLATION

- A. Install product in accordance with supplier's instructions.
- B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
- C. Install product level, plumb, and at heights indicated.
- D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
- E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
 - 1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.

.3 CLEANING, PROTECTION, AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

.4 SIGN SCHEDULE

- A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

SECTION 105050 - METAL LOCKERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS*

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1 Specifications, apply to this Section.

1.02 SUMMARY

1. This includes all metal lockers for school and gym locker rooms.
2. Gym lockers: 3-1/2' ht. concrete base + P.T. wood shims to be provided by G.C.. The concrete base shall be recessed 1/8" from the front edge of the locker.
3. All lockers to have numbers as determined by architect. Numbering plate to be black anodized laser-etched aluminum riveted to locker. Locate number plate near center of each door.
4. All lockers to have a 2-3 mil thick powder coated finish selected from a min. of 25 factory colors.
5. Wood top hardwood benches with steel pedestals

- A. This Section includes the following:

2. "A"- Girl's Locker Room

(68 total, 34 columns, 2 high)

Double Tier 12 wide" x 12 deep" x 72" w/ sloped top.(36" ht. doors)

- 3 1/2" tall concrete base by general contractor.
- All lockers to be anchored to base and wall.
- All welded construction
- Provide 1 wood benche, as described in part 2 of this spec, one shall be handicap accessible.

Manufacturers:

- a. Debourgh
- b. Republic – Double Tier , 16 gauge (basis of design)
- c. List

3. "B"- Boy's Locker Room

(68 total, 34 columns, 2 high)

Double Tier 12 wide" x 12 deep" x 72" w/ sloped top.(36" ht. doors)

- 3 1/2" tall concrete base by general contractor.
- All lockers to be anchored to base and wall.
- All welded construction

- Provide 3 wood benches, as described in part 2 of this spec, one shall be handicap accessible.

Manufacturers:

- a. Debourgh
- b. Republic – Double Tier , 16 gauge (basis of design)
- c. List

4. “C”- Sports Locker Room

(24 total, 24 columns, 1 high)

Single Tier 24 wide” x 12 deep” x 72” w/ sloped top.

- 3 ½” tall concrete base by general contractor.
- All lockers to be anchored to base and wall.
- All welded construction
- Provide 1 wood bench, as described in part 2 of this spec, one shall be handicap accessible.

Manufacturers:

- a. Debourgh
- b. Republic
 - MVP II Athletic Locker with Lockable compartment – (Basis of Design)
- c. List

1.03 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. Shop Drawings: Show lockers in detail, method of installation, fillers, trim, base and accessories. Include locker numbering sequence information.
- C. Samples for verification: **Submit one full-size locker “school locker”** sample for evaluation. Adherence to the specification is required. Locker submitted must meet specification regardless of manufacturer’s standard product. Submit manufacturer’s technical data and installation instructions for metal locker units.
- D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.04 QUALITY ASSURANCE

- A. Uniformity and Single Manufacturer Requirements: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.
- B. Installers Qualifications: Lockers to be installed by an experienced agent of the manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Do not deliver metal lockers until building is enclosed and ready for locker installation.
- B. Storage and Protection: Protect materials from damage during delivery, handling, storage, and installation.

1.06 WARRANTY

- A. Locker manufacturer shall warrant the locker for the lifetime use of the original purchaser from date of shipment. Warranty shall include all defects in material and workmanship, excluding finish, vandalism and improper installation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: DeBourgh is used as basis of design, all other manufacturers must meet or exceed the DeBourgh specifications for each type locker:
 - 1. DeBourgh Manufacturing Company
 - 2. Republic Products
- B. **Type School Lockers:** each locker to be numbered. (odd numbers on top tier, and even numbers on bottom tier).
 - A. Locker Construction
 - 1. Lockers to be welded unibody construction with exposed welds sanded smooth.
 - 2. No bolts, screws or rivets used in assembly of locker units.
 - 3. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions.
 - B. Body of Lockers:
 - 1. Tops, Bottoms, and Sides: Exterior sides constructed of 18 gauge (Ga) domestic cold rolled sheet steel for maximum durability with 18 Ga intermediate partitions.
 - 2. Backs: Solid sheet of 20 Ga cold rolled sheet steel welded to frames of sides and intermediate partitions.
 - 3. Tier Dividers: Full depth 18 Ga CRS securely welded on all four sides, to combine with tops, bottoms, sides, and intermediate partitions to create four-sided continuous door strike.
 - 4. Shelves: 18 gauge.

C. Continuous Door Strike:

1. Tier dividers, tops and bottoms constructed to provide four-sided, continuous door strike for a secure, sanitary and intrusion-free locker while door is in closed position.

D. Doors:

1. Doors are 16 Ga CRS formed outer panel with double bends on both sides and a single bend on top and bottom with 18 Ga steel formed stiffener panel.
2. Door stiffener runs top to bottom on hinge side of door and is securely welded to outer door to form a reinforced channel for additional torque-free strength and sound reduction when closing door. (Inner panel not available on 9 inch wide or box lockers 12 inches high or less).

E. Door Ventilation:

1. Louvered Ventilation.

F. Intermediate Partition Ventilation: Solid

G. Latching:

1. Sentry III Single-Point Latch:

- a. Eleven gauge stationary latch welded securely to locker frame.
- b. Latch extends no more than 1-1/4-inch into locker opening, penetrating through cup.
- c. Flush-mounted, recessed stainless steel cup in a formed door with 18 Ga vertical back panel stiffener.

H. Locking:

- a. Master Lock 1690MD series combination lock with master key. Provide 4 master keys

I. Hinges:

1. 16 Ga continuous piano hinge on the right side of the opening.
2. Hinges welded to door and riveted to locker frame.

J. Slope Tops:

1. Provide 18 Ga all welded slope top with 25 degree pitch, attached at factory with concealed fasteners. Provide mitered slope top at exposed ends. Slope top to be in addition to standard 16 Ga flat top.

K. Filler Panels: Manufacturer's standard fabricated from 18 Ga solid steel finished to match lockers.

C. Gym Lockers.

A. Locker Construction

1. Lockers to be welded unibody construction with exposed welds sanded smooth.
2. No bolts, screws or rivets used in assembly of locker units.
3. Ship lockers ready to be anchored in place in accordance with manufacturer's instructions.

B. Body of Lockers

1. Tops, Bottoms, Sides: Constructed of 16 Ga domestic Cold Rolled Steel (CRS) for maximum durability.
2. Backs: Solid sheet of 18 Ga CRS welded to frames of sides and intermediate partitions.
3. Tier Dividers: Full depth CRS securely welded on all four sides, to combine with tops, bottoms, sides, and intermediate partitions.

C. Continuous Door Strike

1. Tier dividers, tops and bottoms constructed to provide two-sided, continuous door strike on both hinge and latch sides for a secure, sanitary and intrusion-free locker while door is in closed position.

D. Doors

1. Doors are 14 Ga CRS formed outer panel with double bends on both sides and a single bend on top and bottom.
2. Doors to have 18 Ga steel formed stiffener panel securely welded inside the door to form a reinforced channel for additional torque-free strength and sound reduction when closing door.

E. Door Ventilation

1. Diamond perforation

F. Intermediate Partition Ventilation

1. Diamond perforation

G. Latching

1. Sentry II Recessed Gravity Latch:

- a. Door containing stainless steel cup recessed into formed door (doors 18 inches and higher).
- b. 12 Ga steel finger lift mechanism.
- c. Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position
- d. Rubber bumpers riveted to door stops for silent operation

H. Locking: Prep for padlock by locker manufacturer. Provide combination lock, numbered same as lockers, able to change combination, Master key insertable to allow coaches to enter any locker.

I. Hinges

1. Three inch, five knuckle, 14 Ga heavy-duty fast pin welded to both door and frame.

J. Slope Tops

1. Provide 18 Ga all welded slope top with 25-degree pitch, attached at factory with concealed fasteners. Slope top to be in addition to standard 18 Ga flat top. OR

K. Filler Panels: Manufacturer's standard fabricated from 18 Ga solid steel finished to match lockers. Filler available in manufacturer's standard sizes.

D. LOCKER ACCESSORIES

A. Hooks:

1. Hooks to be heavy duty forged steel with ball ends and zinc plated.
2. Rods: heavy duty min. 1.25" dia, chrome plates.
3. Provide two single wall hooks and one double ceiling hook in each locker opening 20 inches or taller.

B. Numbering:

1. Furnish each locker with black anodized laser-etched aluminum number plate.
2. Locate number plate near center of each door.
3. Owner to furnish numbering sequence.

C. Locks:

1. Provide all keyed padlocks and keyed combination lockers for each locker.

E. Wooden Fixed Benches – In Gym Locker Rooms

- a. Ht. 17.5"
- b. Bench tops to have rounded edges and corners.
- c. Min. Thickness - 1-1/4".
- d. Width: 9-1/2"
- e. Length: 6' typical
- f. HC Benches to be 20" deep x 48" long.
- g. Provide 1 handicap bench in each locker room.
- h. Material: Laminated clear hardwood, maple, birch, etc. with one coat of clear sealer on all surfaces and one two coats of clear laquer on top and sides.
- i. Pedestals: Min. 1.5" sch. 40 steel tubing threaded on both ends with stand pipe flange at top and bell shaped cast-iron base. Powder coated finish.
- j. Anchor base with exposed fasteners.

- k. Provide two pedestals for 6' long bench and 4 pedestals for HC bench.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Wall Installation

1. Securely anchor every locker to wall and/or floor before use. Installation hardware to be determined based upon wall/floor construction. Use galvanized or stainless steel anchors.
2. Tie adjacent locker units by bolting at four points, two at top and two at bottom, using ¼ stainless steel bolts.

B. Island Installation:

1. Securely anchor every locker to floor or base before use. Installation hardware to be determined based upon wall/floor construction.
2. Tie adjacent locker units together by bolting at four points, two at top and two at bottom, using ¼ inch cadmium plated bolts.
3. Tie back-to-back locker units together with ¼ inch cadmium plated bolts and washers.

3.02 ADJUSTING

- A. General Requirements: Upon completion of installation, inspect lockers and adjust for proper door and locking mechanism operation.

3.03 CLEANING

A. General Requirements:

1. Clean interior and exposed exterior surfaces, removing debris, dust, dirt and foreign substances on exposed surfaces.
2. Touch up scratches and abrasions to match original finish.
3. Polish stainless steel and non-ferrous metal surfaces.
4. Replace locker units that cannot be restored to factory-finished appearance.
5. Use only materials and procedures recommended by locker manufacturer.

END OF SECTION 10505

SECTION 10 73 00 - ALUMINUM WALKWAY COVERS

PART 1 GENERAL

1.01 SUMMARY

- A. Provided extruded aluminum walkway covers as shown on plans at the following areas:
 - 1. Between Buildings as shown on plans.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes: Design, fabrication, and installation of welded extruded aluminum walkway cover systems.
- C. Products Furnished but not Installed Under this Section: Column sleeves (styrofoam blockouts) or anchor bolts (if required)

1.02 REFERENCES

INCLUDE ONLY THOSE REFERENCES THAT ARE CITED IN THIS SECTION.

- A. The Aluminum Association (AA):
 - 1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2604, Voluntary Specification, Performance Requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels.
 - 4. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM B 209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.

2. ASTM B 221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 3. ASTM C 150, Specification for Portland Cement.
 4. ASTM C 404, Specification for Aggregates for Masonry Grout.
- E. American Welding Society (AWS):
1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

1.03 SYSTEM DESCRIPTION

- A. Design Requirements:
1. Design Walkways in accordance with The Aluminum Design Manual 2000.
 2. Comply with the wind requirements of ASCE 7. 110mph for Baton Rouge, La.
 3. Max. Deflection of components under loading = $l/240$
 3. Provide an all welded extruded aluminum system complete with internal drainage. **Non-welded systems are not acceptable.**
 4. Provide expansion joints to accommodate temperature changes of 120 degrees F. Provide expansion joints with no metal to metal contact.
- B. Performance Requirements:
1. Grout: Compressive strength of 2000 psi, minimum.
- C. The Canopies shall have a delegated design to meet the current IBC wind loads of Lake Charles, Louisiana. Submittals shall include calculations stamped by a professional engineer in the state of Louisiana.**

1.04 SUBMITTALS

- A. Product Data: Manufacturer's product information, specifications, and installation instructions for walkway cover components and accessories.
- B. Shop Drawings: 6 copies Include plan dimensions, elevations, and details.
- C. Samples:
1. Selection: Manufacturer's full range of colors for the finishes selected.
- D. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located. Design calculations shall state that the walkway cover system design complies with the wind requirements of ASCE 7, the stability criteria of applicable building code, IBC 2006 edition, and all other governing criteria. **PLEASE NOTE TO ACKNOWLEDGE WIND UPLIFT CRITERIA FOR WHITE CASTLE, LA.**

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least ten years experience in the design, fabrication, and erection of extruded aluminum walkway cover systems.
- B. Installer Qualifications: Have walkway covers installed by manufacturer, third party installation is not acceptable.

PART 2 PRODUCT

2.01 MANUFACTURERS

THE THREE MANUFACTURERS LISTED BELOW ARE COMPARABLE IN QUALITY. ADD OTHER MANUFACTURERS ONLY AFTER CAREFUL REVIEW OF THEIR FABRICATION TECHNIQUES AND WORKMANSHIP.

- A. The design is based on products fabricated by: Peachtree Protective Covers, Inc., 1477 Rosedale Drive, Hiram, GA 30141, 770-439-2120, fax 770-439-2122.
 - 1. Comparable products by the following manufacturers also will be acceptable:
- 2. A. A. C. E., Inc., Shreveport, LA
 - a. Substitutions: Comparable products of other manufacturers will be considered under standard substitution procedures.

2.02 MATERIALS

- A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.
- B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.
- C. Protective Coating for Aluminum Columns Embedded in Concrete: Clear acrylic.
- D. Grout:
 - 1. Portland Cement: ASTM C 150, Type I.
 - 2. Sand: ASTM C 404.
 - 3. Water: Potable.
- E. Gaskets: Dry seal santoprene pressure type.
- F. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040 inch, minimum.

2.03 MIXES

- A. Grout: 1 part portland cement to 3 parts sand, add water to produce a pouring consistency.

2.04 FABRICATION

- A. General:
 - 1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
 - 2. Welding: In accordance with ANSI/AWS D1.2.
 - 3. Bent Construction: Factory weld beams to columns with neatly mitered corners to form one-piece rigid bents. Make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints may be used

- only if fully welded bents cannot be shipped on local, state, or federal highways without a special permit from the department of transportation.
4. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints at 8 inches on center creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Assemble deck with sufficient camber to offset dead load deflection.
 - B. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage where indicated. Circular downspout opening in column not acceptable.
 - C. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner. Provide structural ties in tops of all beams.
 - D. Deck: Extruded self-flashing sections interlocking into a composite unit. Provide welded plate closures at deck ends.
 - E. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.
 - F.
 1. Factory Finishing for walkway cover: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.
 1. Class 1- Clear Anodic Finish: AA-M-10-C-22A-41 (AAMA611) (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte
 - H.
 1. Factory Finishing for Decorative Wall Brackets: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.
 1. Fluoropolymer (Kynar) finish, AAMA 2604 two coat finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.02 ERECTION

- A. Erect protective cover true to line, level, and plumb. Protect aluminum columns embedded in concrete with clear acrylic. Fill downspout columns with grout to the discharge level to prevent standing water. Install weep holes at top of concrete in non-draining columns to remove condensation.
- B. Provide hairline miters and fitted joints.

3.03 CLEANING

- A. Clean all protective cover components promptly after installation.

3.04 PROTECTION

- A. Protect materials during and after installation.

END OF SECTION 10 73 00

DIVISION 11 – EQUIPMENT

SECTION 11 31 00 - RESIDENTIAL APPLIANCES

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
- C.
 - 1. Division 16 Electrical (note additional switching / wiring at handicapped units).

2.2 SUMMARY

- A. This Section includes the following:
 - 2. Ventilation Hood,
 - 3. Refrigerator,
 - 4. Range
 - 5. Microwave
- B. Items Not Included:
 - 2. N/A

2.3 SUBMITTALS

- A. Product Data: For each appliance type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.
- B. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.
 - 2. Provide appliances equivalent in size, as shown in the following schedule, that qualify for the EPA/DOE ENERGY STAR product labeling program.
- C. Appliance Schedule: Submit schedule of appliances, using the same room designations shown on Drawings.

2.4 DELIVERY

- A. Deliver appliances only after utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

2.5 WARRANTIES

- A. Special Warranties: Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

PART 3 - PRODUCTS

3.1 RESIDENTIAL APPLIANCES

- A. Range Hood – Specified by mechanical engineer see: HVAC plan
 - 2. Provide one in sped room
- B. Microwave
 - a. Frigidaire – Model number EMW1120 (Stainless)
 - 1) Provide one in sped room and one in breakroom
- C. Range
 - a. Frigidaire – Model Number FCRE306LAF (stainless)
 - a. provide one in sped room
- D. Refrigerator
 - a. Frigidaire – Model number: FFHT2022AS (stainless)
 - a. Provide one in sped room and one in breakroom

3.2 FINISHES

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before residential appliance installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions.
- B. Install all owner supplied appliances.

- C. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- D. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- E. Utilities: Refer to Divisions 15 and 16 for plumbing and electrical requirements.
- F. At handicapped units, wire light and vent controls to remotely located switches, at handicapped height.

4.3 ADJUSTING AND CLEANING

- A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.
- D. Deliver operations manuals to owner in project O & M binder.

END OF SECTION 11 31 00

SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Basketball Goal – Suspended from structure (2 main goals and 2 on each side of court, 6 total)
 - 2. Volleyball equipment and cart.
 - 3. Safety pads.
 - 4. Section 033000 "Cast-in-Place Concrete" for installation of floor insert sleeves to be cast in concrete slabs and footings.
 - 5. Section 096466 "Wood Athletic Flooring" for game lines and markers.
 - 6. Section 096566 "Resilient Athletic Flooring" for game lines and markers.

1.3 DEFINITIONS

- A. FIVB: Federation Internationale de Volleyball (The International Volleyball Federation).
- B. NCAA: The National Collegiate Athletic Association.
- C. NFHS: National Federation of State High School Associations.
- D. USAV: USA Volleyball.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: For gymnasium equipment.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
 - 3. Include transport and storage accessories for removable equipment.

- C. Samples: For each exposed product and for each item and color specified.
- D. Samples for Initial Selection: For each type of gymnasium equipment.
- E. Samples for Verification: For the following products:
 - 1. Pad Fabric: Wall padding not less than 3 inches square, and corner and column Samples not less than 3 inches long, with specified treatments applied. Mark face of material.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of gymnasium equipment.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures including glass breakage.
 - b. Faulty operation of basketball backstops.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain gymnasium equipment from single source from single manufacturer.

2.2 BASKETBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in NCAA's and Louisiana High School Athletic Association & Men's and Women's Basketball Rules.
- B. Porter Equipment is Basis of Design, all other manufacturer's must meet or exceed Draper products.
- C. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- D. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- E. Overhead-Supported Backstops:
 - 1. Folding Type: Provide manufacturer's standard assembly for forward-folding, rear-braced with hardware and fittings to permit folding. Provide additional structural piping as needed to attach to building structure. Re: Arch and Sturct. Drawings.
 - a. Manufacturers and Model No. for forward folding:
 - 1) Draper TF20 (Basis Of Design)
 - 2) Gared – 2203
 - 3) Porter 90617-000
 - 4) Provide hoist cable retractor spring or weight
 - 5) See building sections for goal heights.
 - 2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Dual-Mast Frame: Die cut and Welded with cross bracing.
 - b. Finish: Manufacturer's standard polyester powder-coat finish.
- F. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstop.

1. Retractor Device: Spring-activated, reel-type device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one per folding backstop.
- G. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 3. Operator Mounting: As recommended by mfg'r. Insert mounting.
 4. Motor Electrical Characteristics:
 - a. Voltage: 120 V.
 - b. Horsepower: $\frac{3}{4}$ -1 hp.
 - c. Phase: Single.
 5. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for recessed or flush mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.
 - a. Group Key Switch Control Stations: One keyed switch per each backstop.
 - b. Keys: Provide 5 keys to operate all station.
 - c. Switches, Ganged: Single faceplate with multiple switch cut-outs For each switch operating one backstop..
 - d. Control Station Enclosure: Provide prime-painted metal enclosure with key access with two sets of keys per enclosure.
 - e. All 6 goals will be electrically operated and work independently of each other.
 6. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- H. Basketball Backboards, all goals. (provide shot clocks at two main goals. See scoreboard specs)
 1. Shape and Size:
 - a. Rectangular, 72 by 42 inches width by height.
 - 1) Manufacturers
 - a) Gared LXP4200, basis of design
 - b) Porter
 - c) Provide manual basketball backboard adjusters (single post) at two main goals. Gared 1131, basis of design.
- I. Basketball Goals, all goals. Provide anti-whip nylon net.
 1. Manufacturers
 - a. Gared: Collegiate 2500
 - b. Porter Ultra Flex II

- J. Basketball Backboard Padding:
 - 1. Manufacturers
 - a. Same for portable basketball backboard. Provide standard color selections.

2.3 VOLLEYBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in NCAA's "Women's Volleyball Rules and Interpretations."
- B. Manufacturer's
 - 1. Porter
 - 2. Gared
- C. Floor Insert: Chrome-finished steel floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with 3-1/2" ID to fit post standards, not less than 9 inches long to securely anchor pipe sleeve below finished floor in concrete footing; with anchors designed for securing floor insert to floor substrate indicated; one per post standard quantity, (2 pair for main gyp)
 - 1. Floor Plate: Lockable swivel access cover, designed for use with floating wood floors and to be flush with adjacent flooring. Provide two tool(s) for unlocking access covers.
 - 2. Porter 00870-100 cover plate w/ sleeve
 - 3. Gared #6431 cover plate and #6400 sleeve.
- D. Volley Ball Storage/Transport System: (1 thus)
 - 1. Manufacturer's and Model Number
 - a. Porter - 00956100
 - b. Gared - 6295
- E. Volleyball System Package (2 thus)
 - 1. Manufacturer's Model Number and Package
 - a. Porter 1981-0XXSP with Graphic Pads, net antennae, fair ht. chain net, and padded judge's stand. Colors as selected by architect.
 - b. Gared Rallyline 3 1/2" with Graphic Pads, net antennae, fair ht. chain, net, and padded judge's stand. Color as selected by architect.

2.4 SAFETY PADS

- A. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. General Requirements.
 - 1. Thickness: Min. 2", foam core on 1/2" osb.
 - 2. Fabric, min 16 oz. nylon reinforced vinyl fabric, puncture and tear resistant, mildew resistant,
 - 3. Nominal ht. 6', mount above wall base.
 - 4. Nominal width 2'
 - 5. Mounting method – 6' long concealed metal Z mounts top and bottom.

6. Provide molded inserts for all wall switches and receptacles.
 7. Provide 75 linear ft. of pad on each end wall of gym (150 linear feet total). Provide school logo on one side of gym, printed on padding. Logo to be approximately 6'x6'. Architect shall provide graphics.
 8. Color as selected by architect. (Min. 16 colors)
- C. Manufacturer's
1. Porter Durasafe Wall pads
 2. Other Prior approved manufacturers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
1. Verify critical dimensions.
 2. Examine supporting structure, subgrades, subfloors, and footings below finished floor.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
1. Floor Insert Location: Coordinate location with application of game lines and markers, and core drill floor for inserts after game lines are applied.
 2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and floor-plate type.
 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor Insert Setting: Position sleeve in oversized, recessed voids in concrete slabs. Clean voids of debris. Fill void around sleeves with grout, mixed and placed to comply with grout

manufacturer's written instructions. Protect portion of sleeve above subfloor from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.

- E. Wall, Corner, & Column Safety Pads: Mount with bottom edge at 4 inches above finished floor.
- F. Cut-out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.
- G. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- H. Connections: Connect electric operators to building electrical system.
- I. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration is approved by Owner, and store units in location indicated on Drawings.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

SECTION 11 66 43—SCOREBOARDS

PART 1—GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

GYM

- 1. Scoreboards (two thus) large scoreboards with shot clock and led backboards strips and control board.
- 2. Control Board must operate scoreboards via, both wired and wireless.
- 3. Board shall be of school colors as selected by architect from a full range of colors.
- 4. Boards must have vinyl letters in lieu of “HOME”, provide “Central Private” letters.
- 5. Shot clocks (2 thus)
- 6. Scorer’s Table

- B. Related Sections include the following:

- 1. Division 10 Section “Signs” for wall-mounted signs.
- 2. Division 16 Sections for electrical service and connections for scoreboards.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include manufacturer’s written instructions for maintaining and cleaning sign surfaces.
- B. Shop Drawings: Show fabrication and installation details for post and panels signs.
 - 1. Include plans, elevations, and at least ¾-inch scale sections of typical members and other components. Show anchors, reinforcement, accessories, layout, and installation details.
 - a. Show locations of electrical service connections.
 - 2. Include message list, with details of wording and lettering layout, at least half size. Include full-size details of graphics.
 - 3. Wiring Diagrams.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of sign manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain scoreboards through one source from a single manufacturer.
- C. Product Options: Model numbers listed below indicate size, profiles, and dimensional requirements of scoreboards modify boards to accommodate additional alternate text indicated. Refer to Division 1 Section “Product Requirements.”
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect’s approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 DELIVERY AND HANDLING

- A. Deliver scoreboards in protective covering and crating to protect sign components and surfaces against damage.

1.6 COORDINATION

- A. Coordinate delivery time so scoreboards can be installed within 24 hours of receipt at Project site.

1.7 WARRANTY

- A. Warranty Period: 5 years from date of Substantial Completion.

PART 2—PRODUCTS.

2.1 MANUFACTURERS

- A. Manufacturers Large Scoreboards: Subject to compliance with requirements, provide products by one of the following or prior approved equal:

GYM

1. **All American** #8214 +X Basis of design: for basketball and volleyball (two thus in gym) 9' x 5' with 8000 series Console, both wireless and wire control. Battery backup for console and carrying case.
2. **Daktronics** – Panaview - BB2103 – with 5000 all sports console , both wired and wireless operation with battery back up and carrying case.
3. Include backboard shot clock with perimeter led light strip at two main goals in gym. Contractor shall provide all necessary wiring and power for fully functioning scoreboards and shot clocks.
4. Provide (1) scorer's table. **Anthem Sports**, basis of design. Part # A55-705. Shall be 8' in length, folding, school artwork "anthem A55-706" shall be included. Front and siding vinyl padding of school color. Welded steel construction, locking casters, access holes for routing cables.

2.2 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 5005-H15.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 6063-T5.

2.3 ACCESSORIES

- A. Fasteners: Use concealed fasteners fabricated from metals that are noncorrosive to sign material and mounting surface.

- B. Anchors and Inserts: Use stainless-steel or hot-dip galvanized anchors and inserts. Use torque-controlled expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete.

2.4 FABRICATION, GENERAL

- A. General: Provide manufacturer's scoreboards of configurations indicated.
 - 1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
 - 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 - 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 - 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 SCOREBOARDS

- A. General: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16-inch measured diagonally from corner to corner.
 - 1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
 - 2. Increase metal thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
 - 3. Continuously weld joints and seams, unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.
 - 4. Panel Material: 0.080-inch-thick aluminum sheet.
 - 5. Panel Finish: Baked enamel.
 - a. Provide clips welded to back of panels for installation without visible fasteners.
 - 6. Frame Material: Extruded aluminum, fabricated to profile indicated; comply with the following:
 - a. Frame Finish: Baked enamel.
 - b. Corner Condition: Square corners.
 - 7. Copy: Apply copy to face panel by process indicated to produce precisely formed opaque images, free from rough edges.

2.6 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - 1. Color: Black.

PART 3—EXECUTION

3.1 INSTALLATION

- A. Set anchor bolts and other embedded items required for installation. Use templates furnished by suppliers of items to be attached.
- B. Install signs level, plumb, and at height indicated, with surfaces free from distortion or other defects in appearance.

3.2 CLEANING

- A. At completion of installation, clean soiled surfaces of sign units according to manufacturer's written instructions.

END OF SECTION 10436

DIVISION 12 – FURNISHINGS

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manually Operated roller shades
- B. Locations:
 - 1. All exterior windows in the main school building. Curtain walls at entry lobby, locker room A106, and library A127, will not have shades. All roller shades shall be manual.
 - 2. There will be no roller shades in the gym building.
- C. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
 - 2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including solar shade materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified, **10 inches** long.
- D. Samples for Initial Selection: For each type and color of solar shade material.
 - 1. Include Samples of accessories involving color selection.
- E. Samples for Verification: For each type of roller shade.
 - 1. Solar shade Material: Not less than **10 inches** square. Mark inside face of material if applicable.
 - 2. Roller Shade: Full-size operating unit, not less than **16 inches** wide by **36 inches** long for each type of roller shade indicated.
 - 3. Installation Accessories: Full-size unit, not less than **10 inches** long.
- F. Roller-Shade Schedule: Use same designations indicated on Drawings for room numbers and window type.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of solar shade material, signed by product manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- B. Products: Subject to compliance with requirements, provide product by one of the following:
 - 1. [Springs Window Fashions.](#)
 - 2. [Hunter Douglas Contract.](#)
 - 3. MechoShade
- C. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Stainless steel.
 - a. Loop Length: 36" above floor.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Spring Operating Mechanisms: Roller contains spring sized to accommodate shade size indicated. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: per shop drawing review..
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Shadebands:
 - 1. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 2. Source: Roller-shade manufacturer.
 - 3. Type: Basis of Design SheerWeav 4400.
 - 4. Roll Width: 60 inches +/-.
 - 5. Orientation on Shadeband: As indicated on Drawings.
 - 6. Openness Factor: 3 percent.
 - 7. Color: As selected by Architect from manufacturer's full range.
 - a. Type: Exposed with endcaps.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
- G. Installation Accessories:
 - 1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

- a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than **3 inches**.
2. Endcap Covers: To cover exposed endcaps.

2.3 SOLAR SHADE MATERIALS

- A. Solar shade Material Flame-Resistance Rating: Comply with **[NFPA 701]** Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 1. Source: Roller-shade manufacturer.
 2. Type: Basis of Design SheerWeav 4400.
 3. Roll Width: **60 inches +-.**
 4. Orientation on Shadeband: As indicated on Drawings.
 5. Openness Factor: 3 percent. (Blackout shades in Field House Multi-Purpose Rm.)
 6. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at **74 deg F**:
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less **1/4 inch** per side or **1/2-inch** total, plus or minus **1/8 inch**. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less **1/4 inch**, plus or minus **1/8 inch**.
 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Solar shade Fabrication: Fabricate solar shades without battens or seams to extent possible except as follows:
 1. Vertical Shades: Where width-to-length ratio of solar shade is equal to or greater than **[1:4]**, provide battens and seams at uniform spacings along solar shade length to ensure solar shade tracking and alignment through its full range of movement without distortion of the material.
 2. Skylight Shades: Provide battens and seams at uniform spacings along solar shade as required to ensure solar shade tracking and alignment through its full range of movement without distortion or sag of material.
 3. Railroaded Materials: Railroad material where material roll width is less than the required width of solar shade and where indicated. Provide battens and seams as required by railroaded material to produce solar shades with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of solar shade.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Opaque Solar shades: Located so solar shade is not closer than **2 inches** to interior face of glass. Allow clearances for window operation hardware.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 24 13

SECTION 12 36 61 Solid Surface Counters & Sills

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Counters in Breakroom
 - 2. Counter in Restroom
- B. Related Sections:

1.3 ACTION SUBMITTALS

- A. Product Data: For Countertops materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures. (please note: no backsplashes at counters in cafeteria at wall).
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches (150 mm) square.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

- A. Configuration: Provide countertops as shown on plans:
 - 1. Thickness for Countertops: (See finish schedule) with welded seams and undercounter backing strips at seams.

- B. Fabrication: Fabricate sills in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.2 COUNTERTOP MATERIALS

A. Solid Surface Material:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. **Basis of Design: Cosentino**
SS-1: Dekton – Lucid, Re; finish schedule
 - b. SS-1 (Alternate manufacturer) ASCALE

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install windowsills level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).
- B. All counters to have 4" back splashes with returns at side walls (pilasters) and also deeper backsplashes where the counter is recessed down for ADA heights – see drawing elevations. The side walls between counter height differences will also have a solid welded piece of solid surface so there are no voids.
- C. Coordinate countertop locations and electrical fixtures (charging stations) with the architect and electrician before installation.
- D. **Provide heavy duty commercial support brackets at 16" o.c.**, anchored in stud framing. Brackets shall be 1/8" steel, 18" deep leg with 18" deep support arm (verify with counter depth before order). Premium powdered coated finish in color chosen by architect. Brackets shall be 1.5" in width.

END OF SECTION 123661

SECTION 12 66 00 - TELESCOPING STANDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrically operated telescoping stands.
 - 2. Min. 230 seats per each side. See plans for locations and lengths.

1.3 DEFINITIONS

- A. Forward Folding: Wall- or floor-attached bleachers that open in the forward direction by moving the front row away from the stack to the fully extended position.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.
 - 2. Include load capacities, assembly characteristics, and furnished accessories.
 - 3. Include electrical characteristics of electrical components, devices, and accessories.
- B. Shop Drawings: For telescoping stands in both stacked and extended positions.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include load capacities.
 - 3. Show seating layout, aisle widths, row-lettering and seat-numbering scheme, and wheelchair accessibility provisions.
 - 4. Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For each type of exposed product and for each color and texture required.

1. Include Samples of accessories involving color and finish selection.

D. Samples for Verification: For the following products prepared on Samples of size indicated below:

1. Decking: 6-inch-square Samples of finished material.
2. Metal Components: 6-inch-square Sample of each color and finish indicated.
3. Seating Material: 6-inch-square Sample of each seating material, color, and finish indicated.
4. Seat Unit: Full-size unit of each type.
5. Signage: Full-size units for seat numbers.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Product Certificates: For each type of telescoping stand assembly.
- D. Material Certificates: For each type of flame-retardant treatment of upholstery fabric.
- E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands to include in operation and maintenance manuals.
 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Procedures for conducting periodic inspections.
 - b. Precautions for cleaning materials and methods that could be detrimental to telescoping-stand finishes and performance.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.9 FIELD CONDITIONS

- A. Finished Spaces: Do not deliver or install telescoping stands until finishes in spaces to receive them are complete, including suspended ceilings, floors, and painting.

- B. Field Measurements: Indicate measurements on Shop Drawings.

1.10 Warranty

- A. Manufacturer's Product Warranty for Substructure: 10 years from date of substantial completion. Warranty shall include all parts, freight, and labor to replace defective part of part failure due to poor workmanship.
- B. Manufacturer's Product Warranty for All other bleacher components: 5 years from date of substantial completion. Warranty shall include all parts, freight, and labor to replace defective material or failure due to poor workmanship.
- C. Beneficiary: Issue warranty in legal name of project Owner.
- D. Exclusions: Normal wear and tear, abuse, neglect, vandalism, or misuse of product. Acts of God. Product alter or modified by user. User attached accessories. Products not installed by manufacturer. Products not properly maintained in accordance with manufacturer's maintenance procedures or inspections. Natural variations and colors in wood. Polymer Colors and Powder Coating will not fade greater than 5 Delta-E units.
- E. Warranty shall be issued by manufacturer including the above language. Any warranty disputes shall be adjudicated in 19th judicial district court of West Baton Rouge Parish, Louisiana.

PRODUCT DATA SHEET 1 - Warranty Acceptance: Owner is sole authority who will determine acceptance of warranty documents.

- A.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Telescoping stands shall withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.
- B. Accessibility Standard: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design.

2.2 TELESCOPING STANDS

- A. System Description: Operable system of multiple-tiered seating on interconnected folding platforms that close for storage, without being dismantled, into a nested stack. Telescoping-stand units permit opening and closing of adjacent, individual and multiple rows, and close with vertical faces of platforms in the same vertical plane.
 - 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Telescoping-Stands Standard: ICC 300.

- B. Wall-Attached Telescoping Stands: Forward-folding system, in which the bleachers open in the forward direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to wall construction. All sections to open together. The rear rows shall retract first in order.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hussey - Maxxam.
 - b. Sheridan
 - c. Interkal
 2. Row Spacing: 24 inches.
 3. Row Rise: one dimension between 11 and 12 inches.
 4. Seat Type: 10" deep bench type with molded modular seats..
 5. Operation: Electrically operated, with friction-type, integral power unit.
 6. Electrical Characteristics for Each Seating Section:
 - a. Horsepower: 1/2. Per motor
 - b. Voltage: 208/3 phase (verify with telescoping stand supplier).
 - c. The contractor is to verify the voltage requirements and provide the correct phase, outlets, and outlet locations pending the bleacher manufacturer selected at bid. The power requirements shall come at no additional cost to the owner. The contractor is to provide a fully functioning telescoping stand system – no exceptions.
 7. Electrical Controls:
 - a. Control Devices: Walk-along pendant control system.
 - b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.
 - c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 feet, mounted under telescoping seating for audio and visual warning during operation.
 - d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

2.3 COMPONENTS

- A. Benches: Seats and skirts.
1. Material: Molded plastic with contoured surfaces.
 - a. Color: Manufacturer's standard as selected by Architect from manufacturer's standard colors. (Min 15)
 2. Bench Height: Not less than 16 inches or more than 18 inches.
 3. Bench Depth: 10 inches.
- B. Wheelchair-Accessible Seating: Locate removable modular chairs to provide wheelchair-accessible seating at locations indicated on Drawings.
1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by ICC 300.
 2. Equip cutouts with full width recoverable pull out flexible modular seating.

- C. Deck: Manufacturer's standard laminated panel.
 - 1. Finish: Manufacturer's standard clear sealer and varnish.
- D. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.
- E. Safety Rails: Steel, finished with manufacturer's standard powder coat system.
 - 1. Permanently attached self-storing mid-aisle handrails located at centerline of each aisle with seating on both sides.
 - 2. End rails (guards) that are telescoping and self-storing.
 - 3. Back rails (guards) along rear of units where required by ICC 300.
 - 4. Removable rails around accessible seating cutouts and truncations.
 - 5. Color: Black.
- F. Understructure: Structural steel.
 - 1. Finish: Manufacturer's standard rust-inhibiting finish.
 - 2. Color: Manufacturer's standard.
- G. Support Column Wheels: Non-marring, soft, rubber-face wheel assembly under each support column.
 - 1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 4 inches in diameter and 1-1/2 inch wide with 1/2" dia. axle.
- H. Control Devices:
 - 1. Walk-Along Pendant: Manufacturer's standard unit, which plugs into first row of each operating section. Provide two units.
- I. Fasteners: Vibration proof, in manufacturer's standard size and material.

2.4 ACCESSORIES

- A. Steps:
 - 1. Slip-resistant, abrasive tread nosings at aisle steps.
 - 2. Intermediate aisle steps, fully enclosed, at each aisle.
 - 3. Transitional top step, fully enclosed, at each aisle where last row of telescoping stands is adjacent to a cross aisle.
 - 4. Removable front steps, fully enclosed, at each aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.
- B. Signage:
 - 1. Row letters at each row end.
 - 2. Seat numbers at 18 inches o.c. on benches.
 - 3. Accessibility signs at each accessible space.
 - 4. Custom graphics utilizing different colors for a vinyl graphic "bulldog logo" on the front center of bleachers. Provide one graphic on each telescoping stand (each side – 2 thus). The graphic shall be 8'-6" tall by 10'-6" wide. The graphic shall be of a bulldog matching that of the logo on the court, shown in the plans.

- C. Scorer's Table: No scorer's table in project
- D. Video Platform: Provide a video platform for two people. The platform shall be semi permanent, bleachers remain full functional with the platform in place, opening and closing completely. The platform shall be modular and expandable to fit different applications over time. Provide rails around video platform with rail sleeves. The architect shall provide graphics for the two front facing rail sleeves. The video platform shall be fully integrated and part of the telescoping stand purchase.

2.5 MATERIALS

- A. Lumber: Kiln dried, surfaced four sides; southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B & B finish (B and better) grade-of-finish requirements.
- B. Plywood: PS 1 as standard with manufacturer.
- C. Molded Plastic: High-density polyethylene; blow or injection molded, color-pigmented, textured, impact-resistant, with integral reinforcing ribs for attachment and anchoring points. Provide with UV inhibitors to retard fading.

2.6 FABRICATION

- A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.
- B. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- C. Form exposed work with flat, flush surfaces, level and true in line.
- D. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.
 - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install telescoping stands according to ICC 300 and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. ICC 300 Inspection: Inspect installed telescoping stands to verify that construction, installation, and operation are according to ICC 300 requirements.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Telescoping stands will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.

- A. Adjust hardware and moving parts to function smoothly, and lubricate, test, and adjust each telescoping stand unit to operate according to manufacturer's written instructions.
- B. Clean installed telescoping stands on exposed and semi exposed surfaces. Touch up factory-applied finishes or replace components as required to restore damaged or soiled areas.
- C. Replace upholstery fabric damaged during installation or work of other trades.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands. **END OF SECTION 126600**

DIVISION 21 – FIRE SUPPRESSION

SECTION 21 00 00 – FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. The General Conditions of the Contract and Supplementary Conditions of the Contract shall govern the work under this Section of the Specifications. The Contractor is specifically directed to refer to said conditions.
- B. It is understood that these specifications, and the accompanying drawings, complement complete apparatus, fully erected and in successful operating condition. All work must be preformed in the best and most substantial manner.
- C. These specifications are intended to provide complete, and in proper operation, all sprinkler system piping, equipment, heads, valves, controls, air compressor, and accessories, all as specified herein or shown on the accompanying drawings, or reasonably implied in either. The building shall be provided with complete coverage sprinkler system for the spaces designated on the drawings classification as required. System shall consist of a calculated dry system unless indicated otherwise. Verify all pertinent criteria. The systems shall conform to layout shown and meet all requirements of agencies listed under "REGULATIONS AND STANDARDS" below. Refer to plans and specifications for additional information.
- D. Pipe, fittings, valves, and connections for fire protection and sprinkler systems shall be furnished by fire protection contractor.

1.2 RELATED WORK:

- A. Section 21 13 13 - Wet-pipe Sprinkler Systems.

1.3 SYSTEM LAYOUT:

- A. Where plans indicate layout of system components, the layout shall be verified to comply with "REGULATIONS AND STANDARDS" and shall be revised if required to comply. The location of the sprinkler system piping and components shall be coordinated with all other trades. Revisions to sprinkler system layout shall be at Sprinkler Contractor's expense. Any such revisions shall be verified with the Architect.

1.4 ELECTRICAL WORK:

- A. See "COORDINATION".

1.5 SPRINKLER SYSTEM CONTRACTOR:

- A. It is intended that the work under this section is to be preformed by a qualified Fire Protection Piping Systems Contractor regularly engaged in this type of work. The Contractor is to hold a current license to perform this work and be certified by the State Fire Marshall. All documents shall bear this certification

1.6 REGULATIONS, STANDARDS AND REFERENCES:

- A. It is the intention of these specifications and the accompanying drawings, that all elements and features of the fire protection system shall be in accordance with the standards of the National Fire Association (NFPA), the State Fire Marshall, all applicable building codes and Property Insurance Association of Louisiana whether so indicated or not. NFPA standards are on file in office of Engineer and may be examined at the Contractor's request.
- B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 150.
- C. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150. Interior of building.
- D. Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- E. NFPA 13 - Installation of Sprinkler Systems.
- F. NFPA 14 - Standpipe and Hose Systems.

1.7 QUALITY ASSURANCE:

- A. Conform to NFPA 13 for sprinkler systems.
- B. Conform to NFPA 14 for standpipe hose systems.
- C. Welding Materials and Procedures: Conform to ASME Code.
- D. Employ certified welders in accordance with ANSI/ASME Section 9. AWS D10.9.
- E. Valves: Bear UL FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.8 SUBMITTALS:

- A. Submit product data under provisions of section 01 30 00 - Administrative Requirements
- B. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.
- C. Indicate valve data and ratings.

1.9 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver and store valves in shipping containers, with labeling in place, under provisions of Section 016000– Product Requirements.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures. Maintain in place until installation.

1.10 AREAS SUBJECT TO FREEZING:

- A. For areas requiring protection and not receiving direct heating during times of potential freezing, such as building overhangs, porches, canopies, attics, etc. provide a compressed air dry pipe system for these areas only, see drawings for locations. Coordinate electrical requirements with contractor.

1.11 MANUFACTURER'S OR TRADE NAMES:

- A. Where the plans or specifications mention the names of manufacturers or the products of specific manufacturers, it is intended that the Contractor shall furnish the item or items as specifies. Products of manufacturers that are not mentioned shall be subject to prior review by the Engineer and shall in any case mentioned shall be subject to prior review by the Engineer and shall in any case be in accordance with regulations and standards as state above.

1.12 SHOP DRAWINGS AND SUBMITTAL DATA:

- A. Within fifteen (15) days of award of the contract, the contractor shall submit six (6) copies of system piping shop drawings and six (6) copies of manufacturer's data and descriptive literature and drawings for all equipment and materials. Additionally, provide a reproducible (sepia) copy of the system piping shop drawings. All drawings, literature and data on all equipment shall be submitted at the same time; this material shall contain complete layout, capacity data, dimensions and other pertinent information necessary for the Architect to properly review and evaluate the item that necessary to meet the requirements for submittal to the State Fire Marshall.
- B. The contractor shall obtain approval of agencies listed under "REGULATIONS AND STANDARDS" before submitting to the Engineer, except that the date for State Fire Marshall's review shall be submitted to the Engineer prior submitting to the Fire Marshall. All required review fees and applicable requirements shall be by the contractor. No item of equipment or material shall be place on order until Final Review comments have been received from the Architect. See "DRAWINGS" below.

1.13 ORDINANCES, RULES AND REGULATIONS:

- A. All material and construction shall conform to the requirements of all building, plumbing and sanitary codes and laws in force in the locality in which the work is to be done. All materials and construction shall also conform to the rules and regulations listed above under "REGULATIONS

AND STANDARDS".

1.14 DRAWINGS:

- A. The contractor shall submit detailed drawings for all sprinkler system showing exact locations and sizes of all elements in the system before fabrication is begun. Engineer shall have the prerogative of changing the position or configuration of these systems without changing the total scope of work involved to comply with "REGULATIONS AND STANDARDS".

1.15 GUARANTEE:

- A. The contractor shall guarantee all materials and workmanship under this contract for a period of one (1) year from date of final acceptance of his work and shall repair or replace any such defective materials and workmanship without cost to the Owner.
- B. The guarantee shall include complete service, including adjustment service and inspection, during the guarantee period as required by agencies listed under "REGULATIONS AND STANDARDS".

1.16 APPROVAL OF PRODUCT PRIOR TO BIDDING

- A. Refer to Instructions to Bidders

PART 2 - PRODUCTS

2.1 PIPE AND TUBE:

- A. See Section – 21 13 13 Wet-pipe Sprinkler System
- B. Underground pipe shall be C900 to within 5' of building.

2.2 PIPE FITTINGS:

- A. Steel Fittings: ANSI/ASME B16.9, wrought steel, butt welded. ANSI/ASME B16.25, butt weld ends. ASTM A234, wrought carbon steel and alloy steel. ANSI/ASME B16.5, steel flanges and fittings. ANSI/ASME B16.11, forged steel socket welded and threaded.
- B. Cast Iron Fittings: ANSI/ASME B16.1, flanges and fittings. B16.4, screwed fittings.
- C. Malleable Iron Fittings: ANSI/ASME B16.3, screwed type. ANSI/ASTM A47.

2.3 JOINT MATERIALS:

- A. Solder: ANSI/ASTM B32, 95/5 alloy.
- B. Brazing: ANSI/AWS A5.8.
- C. Threaded Joint Compound.

2.4 UNIONS, FLANGES, AND COUPLINGS:

- A. Unions: 150 psi malleable iron for threaded ferrous piping.
- B. Flanges: 150 psi forged steel slip-on flanges for ferrous piping.

2.5 ACCEPTABLE MANUFACTURER - GATE VALVES:

- A. Nibco 637-31
- B. Central 722 U Series
- C. Substitutions: Under provisions of Instructions To Bidders.

2.6 GATE VALVES:

- A. Bronze, rising stem, inside screw, solid wedge.

2.7 ACCEPTABLE MANUFACTURERS - GLOBE OR ANGLE VALVES:

- A. Nibco GS-132-U
- B. Crane 143
- C. Substitutions: Under provisions of Instructions To Bidders.

2.8 GLOBE OR ANGLE VALVES:

- A. Bronze, rising stem, inside screw, renewable composition disc.

2.9 ACCEPTABLE MANUFACTURERS - CHECK VALVES:

- A. NIBCO CS-172
- B. Crane 147
- C. Substitutions: Under provisions of Instructions To Bidders.

2.10 CHECK VALVES:

- A. Iron body, bronze trim, swing disc, renewable disc and seat.

2.11 ACCEPTABLE MANUFACTURERS - BUTTERFLY VALVES:

- A. Nibco LD 3510-2 Series
- B. Central Fig. 570 or 580
- C. Substitutions: Under provisions of Instructions To Bidders.

2.12 BUTTERFLY VALVES:

- A. Iron body, bronze stainless steel disc and stem extended for insulated work, resilient replaceable liner seat.

2.13 ACCEPTABLE MANUFACTURERS - DRAIN VALVES:

- A. Nibco F-667-0 Series
- B. Central 722 U Series
- C. Substitutions: Under provisions of Instructions To Bidders.

2.14 DRAIN VALVES:

- A. Brass ball valve with cap and chain, 3/4 inch (19 mm) hose thread.

2.15 VALVE OPERATORS:

- A. Provide handwheels for gate, globe or angle, and drain valves.
- B. For butterfly valves provide gear operators for sizes 8 inches and larger. For smaller sizes provide level lock handle with toothed plate.

2.16 VALVE CONNECTIONS:

- A. Provide valve connections to match pipe joints. Use valves of pipe size.
- B. For copper tube, provide threaded solder adapters for connection to valve.
- C. Provide butterfly valve with tapped lug body when used for isolating service.

2.17 SIAMESE FIRE DEPARTMENT CONNECTIONS:

- A. Provide two-way standard siamese fire department connection with chrome plated finish, local fire department threads, dust caps and chains, 3/4" automatic drip, marked "SPRINKLER - FIRE DEPARTMENT CONNECTION:.

2.18 ACCEPTABLE MANUFACTURERS - SPRINKLER HEADS:

- A. Reliable Automatic Sprinkler
- B. Viking Corp.
- C. Tyco-Fire
- D. Substitutions: Under provisions of Instruction To Bidders.

PART 3 - INSTALLATION

3.1 GENERAL:

- A. Furnish and install in a neat workmanlike manner, all piping shown on drawings or that is specified or required to provide a complete, properly operating installation. All piping and accessories shall conform to standards as applicable.
- B. Run piping parallel with the lines of the building, unless specifically shown or noted otherwise. All pipe, fittings, valves, etc., shall have sufficient clearance from other work to finish at least 1/2 inch from other work or finished covering of other piping.
- C. Provide all necessary hangers, anchors, thrust blocks, etc., to properly support and protect piping system, as required by agencies listed under "REGULATIONS AND STANDARDS".
- D. Under no circumstances is the contractor to attach to or support from any bar joist bridging. Any supports to the bar joists or any structural systems are to be approved by the Architect/Engineer. All supplement angle or channel iron required to support equipment of this Specification is to be furnished by the contractor and is to be independent of any other supports.

3.2 DESIGN:

- A. The sprinkler systems shall be designed as required for occupancies specified by experienced personnel have competency in the execution of such work. Sprinkler system design shall be performed only by licensed sprinkler contractors.
- B. Sprinkler piping shall be protected from freezing during the lay-a-way period.
- C. NFPA rules and regulations governing the design shall be scrupulously adhered to.

- D. Piping shall be installed in accordance with NFPA 13.

3.3 EXECUTION:

- A. Run piping concealed above furred ceiling and in joists to minimize obstructions. Expose only heads.
- B. Coordinate sprinkler piping routing and heads with all trades.
- C. Protect sprinkler heads against mechanical injury.
- D. Include all costs of shop drawings review and approval from authorities in price.
- E. Locate outside alarm on wall of building adjacent to Siamese department connections.
- F. Provide cabinet containing required number of spare heads as per NFPA 13, of each type, along with wrench suitable for each type of head.
- G. Provide flow switch on leaving side of main valve and monitoring switch on main valve. Flow switch shall sense flow and sound appropriate zone of fire alarm system monitoring switch on each main valve; when valve is started to its "closed" position shall indicate trouble on appropriate zone of fire alarm system and sound local audible alarm. Wiring between flow switches and monitoring switches and fire alarm system shall be provided under the Electrical Division.
- H. Furnish and install sprinkler zone valves and flow switches where indicated on the drawings for the zoning of the system. Each of these devices shall be connected into the fire alarm system as indicated for the main valve, including local alarming.
- I. Provide all test and drain valves as required per NFPA 13.
- J. Support sprinkler piping in accordance with NFPA 13.
- K. Provide new water service as shown on the drawings.
- L. Install air compressor on vibration isolators, as required.
- M. Screw joint steel piping up to and including 1-1/2 inch diameter. Screw or Roll Goove 2 inch diameter and larger. PER NFPA 13.
- N. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- O. Coat threaded ends with pipe lubricant compound.
- P. Steel piping, main sized saddle branch connections or direct connection of branch lines to mains is permitted if main is one pipe size larger than the branch for up to 6 inch mains and if main is two pipe sizes larger than branch for 8 inch and larger mains.

- Q. Solder Braze copper tubes.
- R. Install piping in accordance with NFPA 13 for sprinkler systems and NFPA 14 for standpipe and hose systems.
- S. Do not penetrate building structural members unless indicated.
- T. Provide sleeves when penetrating footings floors and walls.
- U. Seal pipe and sleeve penetration to achieve fire resistance equivalent to fire separation required.

3.4 INSTALLATION - VALVES:

- A. Install valves with stems upright or horizontal, not inverted.
- B. Provide gate valves for shut-off or isolating service.
- C. Where approved, butterfly valves may be used instead of gate valves.
- D. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.5 SLEEVES AND PLATES:

- A. Wherever pipes pass through concrete slabs, furnish and install sleeves, properly located for the work.
- B. Use sleeves of sufficient size to allow the specified pipe covering to pass through the sleeves and finish sleeves flush with walls and ceiling.
- C. Sleeves shall be galvanized steel not lighter than 24 gauge.
- D. Seal spaces between sleeve and pipe. Use packing device or material for UL rating to match rating of wall or floor/ceiling as rated under UL File R9658.

3.6 ESCUTCHEONS:

- A. Where pipes passing through floors, walls or ceiling exposed to view in finished areas, provide pressed steel split plates which cover the opening and fit snugly to pipe.

3.7 COORDINATION:

- A. All interlock and signal wiring runs to the annunciator panel will be furnished and installed and as part of the Electrical Work.
- B. This contractor shall provide for all switches and interlocking devices on all valves as required.

3.8 UNDERGROUND PIPING:

- A. Underground fire protection system piping shall be installed in accordance with the requirements of NFPA 24, Private Fire Service Mains and Their Appurtenances. Provide concrete thrust blocking at each change of direction of the piping and at all tees, plugs, and caps in accordance with NFPA 24. Where thrust blocking is impractical, fittings with a mechanical joint retainer gland, approved for the piping material utilized, may be used in lieu of thrust blocking.

END OF SECTION 21 00 00

SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Installation of new sprinkler and related piping systems in new construction.

1.2 WORK INSTALLED BUT SPECIFIED UNDER OTHER SECTIONS

- A. Section Fire Protection Piping: Piping and valves.

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish sleeves to General Contractor.

1.4 RELATED WORK

- A. Section 23 05 29 - Supports and Anchors.

1.5 REFERENCES:

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volt maximum).
- B. NFPA 13 - Installation of Sprinkler Systems.

1.6 SYSTEM DESCRIPTION:

- A. System to provide coverage for entire new building area.
- B. Interface system with building control system. Building fire and smoke alarm system.
- C. Provide system per NFPA 13 hazard requirement.

1.7 QUALITY ASSURANCE:

- A. Design and installation to conform to NFPA 13.
- B. Equipment and components: Bear UL FM label or marking.

- C. Specialist Firm: Company specializing and licensed in sprinkler systems.

1.8 REGULATORY REQUIREMENTS:

- A. Hydraulic Calculations, Product Data, Shop Drawings: Bear stamp of approval of Fire Marshal.
- B. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories.
- C. Submit shop drawings product data hydraulic calculations to Fire Marshal. Submit proof of approval to Architect. Include check for review fee with submittal to Fire Marshal's office.

1.9 PROJECT RECORD DOCUMENTS:

- A. Submit documents under provisions of Section 01 78 39.

1.10 OPERATION AND MAINTENANCE DATA:

- A. Submit manufacturer's operation and maintenance data under provisions of Section 01 78 23.
- B. Include written maintenance data on components of system, servicing requirements, and record drawings.
- C. Include maintenance, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.11 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver and store materials in shipping containers with labeling place under provisions of Section 01 60 00.
- B. Provide suitable wrenches for each head type.
- C. Maintain caps in place until installation.

1.12 EXTRA STOCK:

- A. Provide extra sprinkler heads under provisions of NFPA 13.
- B. Provide suitable wrenches for each head type.
- C. Provide storage cabinet, size and type as per NFPA-13

PART 2 - PRODUCTS

2.1 PIPING MATERIALS:

- A. Above Ground Inside Building Piping: Pipe diameter smaller than and up to 2" shall be Steel Schedule 40 pipe, Pipe diameters 2-1/2" and larger shall be Steel Schedule 10 or Steel Schedule 40 pipe, As permitted by NFPA 13.

2.2 ACCEPTABLE MANUFACTURERS - SPRINKLER HEADS:

- A. Reliable Automatic Sprinkler
- B. Viking Corp.
- C. Tyco-Fire
- D. Substitutions: Under provisions of Instruction To Bidders.

2.3 SPRINKLER HEADS:

- A. Exposed Area Type: Standard upright type with brass finish.
- B. Sidewall Type: Brass Chrome plated finish with matching escutcheon.
- C. Fusible Link: Temperature rated for specific area hazard.
- D. Guards: finish to match sprinkler head.
- E. Finished ceilings: Pendent sprinklers - concealed type with white cover plates. Unless otherwise noted on plans.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Place pipe runs to minimize obstruction to other work.

3.2 INSTALLATION:

- A. Run piping concealed above furred ceiling and in joists to minimize obstructions. Expose only heads.
- B. Coordinate sprinkler piping routing and heads with all trades.

- C. Protect sprinkler heads against mechanical injury.
- D. Include all costs of shop drawings review and approval from authorities in price.
- E. Locate outside alarm on wall of building adjacent to siamese fire department connections.
- F. Provide cabinet containing required number of spare heads as per NFPA 13, of each type, along with wrench suitable for each type of head.
- G. Provide flow switch on leaving side of main valve and monitoring switch on main valve. Flow switch shall sense flow and sound appropriate zone of fire alarm system monitoring switch on each main valve; when valve is started to its "closed" position shall indicate trouble on appropriate zone of fire alarm system and sound local audible alarm. Wiring between flow switches and monitoring switches and fire alarm system shall be provided under electrical division.
- H. Furnish and install sprinkler zone valves and flow switches where indicated on the drawings for the zoning of the system. Each of these devices shall be connected into the fire alarm system as indicated for the main valve, including local alarming.
- I. Provide all test and drain valves as required for system per NFPA 13.
- J. Support sprinkler piping in accordance with NFPA 13.
- K. Provide new water service as shown on the drawings.

3.3 CLEANING:

- A. Flush entire piping system of foreign matter.

3.4 SYSTEM TESTS:

- A. Hydrostatically test entire system.
- B. Test shall be witnessed by Fire Marshal and Architect.

END OF SECTION 21 13 13

**DIVISION 22 -
PLUMBING**

SECTION 22 10 00 - PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and Pipe Fittings
- B. Valves
- C. Sanitary Sewer Piping System
- D. Domestic Water Piping system
- E. Service Connections

1.2 RELATED WORK

- A. Section 23 00 00 - General Provisions
- B. Section 23 05 16 - Expansion Compensation
- C. Section 23 05 23 - Supports and Anchors
- D. Section 23 07 00 - Piping Insulation
- E. Section 22 10 10 - Plumbing Specialties
- F. Section 22 40 00 - Plumbing Fixtures and Trim

1.3 REFERENCES:

- A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- D. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
- E. ANSI/ASTM B32 - Solder Metal.
- F. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

- G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- H. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- I. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- J. ASTM B88 - Seamless Copper Water Tube.
- K. ASTM B306 - Copper Drainage Tube (DWV).
- L. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- M. AWS A5.8 - Brazing Filler Metal.
- N. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.
- O. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary System.
- P. CISPI 310 – Standard for cast iron couplings
- Q. LSPC – The latest addition of the Louisiana State Plumbing Code.

1.4 QUALITY ASSURANCE:

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec. 9. ANSI/AWS D 1.1.
- D. Cast iron pipe and fittings shall be marked with CISPI's collective trademark.

1.5 SUBMITTALS:

- A. Submit shop drawings and product data under provisions of Section 01 30 00.
- B. Include data on pipe material, pipe fittings, valves and accessories.

1.6 WATER PIPE AND FITTING MATERIALS STANDARD

- A. Plastic Water Pipe and Fittings
 - 1. ABS and PVC Plastic Tubular Fittings: ASTM F 409, ANSI/NSF 24, ANSI/NSF 14
 - 2. Joints for IPS PVC pipe using solvent cement: ASTM D 2672
 - 3. Chlorinated poly (vinyl chloride) (CPVC) plastic pipe, Schedule 80, 2" and under: ASTM F 441, listed
 - 4. Chlorinated poly (vinyl chloride) (CPVC) plastic pipe (SDR-PR): ASTM F 442

5. CPVC Pipe and fittings: ASTM D 2846, Listed
 6. Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) pressure pipe and fittings: ASTM F 1281
 7. Cross-linked Polyethylene (PEX) plastic hot and cold water distribution system: ASTM F 877, Listed
 8. Cross-linked Polyethylene (PEX) tubing: ASTM F 876
 9. Cross-linked Polyethylene (PEX) tubing systems for pressure: CAN/CSA-B137.5M89, listed
 10. Flexible Elastomeric pressure joints: ASTM D 3139, See 303.8
 11. Metal insert fittings for PB tubing: ASTM F 1380
 12. Polyethylene/Aluminum/Polyethylene (PE-AL-PE) pressure pipe and fittings: ASTM F 1282
 13. Polyethylene pipe and tubing (PE) Number 2305, 2306, 3306, 3406, 3408: ASTM D 2104, ASTM D 2239, ASTM D 2737, Listed, See 303.8.2
 14. Poly (vinyl chloride) (PVC) plastic pipe fittings, Schedule 40: ASTM D 2466
 15. Pressure rated ABS-fittings: ASTM D 2468, Listed
 16. Pressure rated ABS-pipe Number 1210, 2112, 1316: ASTM D 1527, ASTM D 2282, Listed, See 303.8.2
 17. PVC injection molded gasketed fittings for pressure applications: CAN/CSA-B137.2-M89, Listed
 18. PVC Pipe, Number 1120, 1220: ASTM D 1785, ASTM D 2241, listed, See 303.8.2
 19. PVC socket-type fittings, Schedule 80: ASTM D 2467, listed
 20. Socket-type chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 80, 2" and under: ASTM F 439, listed
 21. Threaded chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 80, 2" and under: ASTM F 437, listed
- B. Ferrous Water Pipe and Fittings
1. Cast Iron fittings (threaded): ASTM A 126
 2. Cast iron pipe (threaded): ANSI A40.5
 3. Cast iron water pipe: ASTM A377
 4. Ductile-iron water pipe: ANSI/AWWA C 151/A 21.51
 5. Ductile-iron water fittings: ANSI/AWWA C 110/A 21.10
 6. Malleable iron fittings (threaded): ASTM A 197
 7. Nipples pipe (threaded): FS WW-N-351a
 8. Stainless steel water pipe Grade H: ASTM A 268, See 303.8.4
 9. Steel couplings, threaded, black and galvanized: ASTM A 865
 10. Steel pipe black and galvanized: ASTM A 53
 11. Welded and seamless steel pipe: ASTM A 53
- C. NonFerrous Pipe and Fittings
1. Cast bronze fittings for flared copper tube: ANSI B16.26
 2. Cast bronze threaded fittings: ASME B16.15
 3. Cast bronze solder-joint pressure fittings: ANSI B16.18
 4. Cast copper alloy fittings for flared copper tubes: ASME B 16.26
 5. Pipe flanges and flanged fittings: ANSI B16.5
 6. Seamless brass tube: ASTM B 135
 7. Seamless copper pipe: ASTM B 42
 8. Seamless copper tube: ASTM B 75
 9. Seamless copper water tube types K, L, & M: ASTM B 88
 10. Seamless red brass pipe: ASTM B 43

11. Seamless and welded copper distribution tube (type D): ASTM B 641
 12. Threadless copper pipe (TP): ASTM B 302
 13. Welded brass tube: ASTM B 587
 14. Welded copper tube: ASTM B 447
 15. Welded copper alloy UNS # C21000 water tube: ASTM B 642
 16. Wrought copper and copper-alloy solder-joint pressure fittings: ASME B 16.22 for copper water tube
 17. Wrought seamless copper and rectangular copper-alloy pipe and tube: ASTM B 251, square and tubing not applicable
 18. Valves-flanged threaded, and welding end: ANSI B 16.34
- D. Backflow Prevention Devices Materials Standard
1. Air gap standards: ASME A112.1.2
 2. Backflow preventers, double check valve assembly: ASSE 1015, ANSI/AWWA C510
 3. Backflow preventers with intermediate atmospheric vent: ANSI/ASSE 1012
 4. Backflow preventers, double check detector assembly: ANSI/ASSE 1048
 5. Backflow preventers, hose connection: ANSI/ASSE 1052
 6. Backflow preventers, reduced pressure detector assembly: ANSI/ASSE 1047
 7. Backflow preventers, reduced pressure principle assembly: ANSI/AWWA C511, ASSE 1013
 8. Dual check valve type backflow preventer: ASSE 1032, for carbonated beverage dispensers-post mix type
 9. Field test procedures for backflow preventer assemblies: ASSE 5010
 10. Manual for the selection, installation, maintenance, and field testing of backflow prevention devices: CAN/CSA B64.10
 11. Vacuum breakers, Anti-Siphon, pressure type assembly (outdoor use): ASSE 1020
 12. Vacuum breakers-atmospheric pipe applied: ANSI/ASSE 1001
 13. Vacuum breakers, back siphonage, pressure type assembly (spill resistant): ANSI/ASSE 1056
 14. Vacuum breakers, hose connections: ANSI/ASSE 1011
 15. Vacuum breakers, laboratory faucet: ANSI/ASSE 1035
 16. Vacuum breaker wall hydrants, fronts resistant automatic draining: ASSE 1019
 17. Water closet flush tank fill valves (ballcocks): ASSE 1002
- E. Valves Material Standards
1. Valves, bronze gate: MSS SP-80
 2. Valves, cast iron gate: ASTM A 126
 3. Valves, ball: MSS SP-72, MSS SP-110
 4. Valves, resilient-seated gate: ANSI/AWWA C509
- F. Temperature Control Device Standards
1. Individual shower control valves, anti-scald: ASSE 1016
 2. Temperature actuated mixing valves for primary domestic use: ASSE 1017
 3. Water supply valves, mixing valves and single control mixing valves: ASSE 1029
- G. Potable Water Piping
1. All potable water pipes, pipe related products, and materials that join or seal pipes conform to ANSI/NSF 61.

1.7 DRAINAGE SYSTEM MATERIALS STANDARDS

A. NonMetallic Piping

1. Concrete drain tile: ASTM C 412
2. Concrete perforated: ASTM C 444
3. Concrete reinforced culverts: ASTM C 76, for storm drains only
4. Concrete reinforced sewer pipe: ASTM C 361, for storm drains only
5. Concrete sewer pipe: ASTM C 14, for storm drains only
6. Sewer manholes: ASTM C 478
7. Concrete (steel cylinder type): FS SS-P-381

B. Plastic Pipe and Fittings

1. Coextruded composite pipe: ASTM F 1488, See 303.8.3, 303.8.5, 704.1, 1101.5, 1103.2, 1103.4
2. Coextruded composite drain, waste, and vent pipe (DWV): ASTM F 1499, See 303.8.3, 303.8.5, 704.1, 1101.5, 1103.2, 1103.4
3. Coextruded PVC plastic pipe: ASTM F 891, See 303.8.3, 303.8.5, 704.1, 1101.5, 1103.2, 1103.4
4. Flexible elastomeric non-pressure joints: ASTM D 3212, See 303.8
5. Large diameter ribbed PVC sewer pipe and fittings: CAN/CSA-B182.4
6. Polyolefin laboratory drainage systems: CAN/CSA-B181.3
7. PVC-DWV pipe and fittings: ASTM D 2665, listed, See 303.8.3
8. Type PS 46 and type PS 115 sewer pipe (for outside building sewers, storm drains): ASTM F 789, See 704.1, 1101.4, 1103.2, 1103.4, ASTM D 2321, installation
9. Type PSM PVC sewer pipe and fittings (for outside building sewers, storm drains, and storm sewers): ASTM 3034, See 704.1, 1101.5, 1103.2, 1103.4, ASTM D 2321, installation
10. Type PSP PVC sewer pipe and fittings (for outside building sewers, storm drains, and storm sewers): ASTM D 2321, Installation
11. All plastic piping pipes, plastic plumbing piping components and related materials shall be listed as conforming with ANSI/NSF Standard 14.

C. Ferrous Pipe and Fittings

1. Cast iron soil pipe and fittings: ASTM A 74, CISPI HS
2. CI NO-HUB pipe and fittings: ASTM A 888, CISPI Std. 301
3. Ductile-iron gravity sewer pipe: ASTM A 746
4. Hubless cast iron sanitary system: CISPI Std. 310
5. Manhole top frames and covers: ASTM A 48

D. NonFerrous Pipe and Fittings

1. Cast copper alloy solder-joint drainage fittings: ASME B 16.23, for plumbing drainage waste and vents
2. Cast copper alloy solder-joint fittings for solvent drainage systems: ANSI B 16.32
3. Copper drainage tube DWV: ASTM B 306
4. Welded copper and copper alloy heat exchanger tube: ASTM B 543
5. Wrought copper and wrought copper alloy solder-joint drainage fittings for plumbing drainage waste and vents: ASME B 16.29
6. Wrought copper and wrought copper alloy solder-joint fittings for solvent drainage systems: ANSI B 16.43

- E. Glass pipe
 - 1. Borosilicate glass pipe and fittings for DWV applications: ASTM C 1053

PART 2 - PRODUCTS

- 2.1 SANITARY SEWER PIPING AND STORM SEWER - BURIED BEYOND 5 FEET OF BUILDING:
 - A. Schedule 40 PVC/DWV
Fittings: Same as piping
Joints: Solvent welded
- 2.2 SANITARY SEWER AND STORM SEWER PIPING - BURIED WITHIN 5 FEET OF BUILDING:
 - A. Cast Iron Pipe: ASTM A74, service weight.
Fittings: Cast Iron.
Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
 - B. Cast Iron Pipe: CISPI 301, hubless, service weight.
Fittings: Cast Iron.
Joints: CISPI 310 neoprene gaskets and stainless steel clamp-and-shield assemblies.
- 2.3 SANITARY SEWER AND STORM SEWER PIPING, ABOVE GRADE:
 - A. Cast Iron Pipe: ASTM A74, service weight.
Fittings: Cast Iron.
Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
 - B. Cast Iron Pipe: CISPI 301, hubless, service weight.
Fittings: Cast Iron.
Joints: CISPI 310 neoprene gaskets and stainless steel clamp-and-shield assemblies.
- 2.4 WATER PIPING, ABOVE GRADE: Exterior water piping buried beyond 5' of building to be Schedule 40 PVC
 - A. Copper Tubing: ASTM B88, Type L, hard drawn.
Fittings: ANSI/ASME B16.18, cast bronze solder-joint pressure fittings, or ANSI/ASME B16.22, wrought copper.
 - B. All potable water pipes, pipe related products and materials that join or seal pipes and pipe related products shall be evaluated and listed as conforming with a national consensus product or material

standard and ANSI/NSF Standard 61.

2.5 WATER PIPING, TRAP PRIMERS: Piping for trap primer piping below slab only.

- A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

2.6 FLANGES, UNION, AND COUPLINGS:

- A. Pipe Size two (2) Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, solder joints.
- B. Pipe Size Over two (2) Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service.
- C. Dielectric Connections: Unions with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 GATE VALVES

- A. Up to two (2) Inches: Bronze body, non-rising or rising stem and handwheel, inside screw, single double wedge or disc, solder or threaded ends. Nibco Model 113 Series, Crane Model 438 Series, Powell Model 2700, Hammond 2B 617 or approved equal.
- B. Over two (2) Inches: Iron body, bronze trim, non-rising or rising stem and handwheel, OS&Y, single wedge, flanged ends. Red and White 415/421, NIBCO F619/F617, Crane 461/465 1/2 or approved equal.

2.8 GLOBE VALVES:

- A. Up to 2 Inches: Bronze body, rising stem and handwheel inside screw, renewable composition disc, solder screwed ends, with backseating capacity. Nibco Model 211 Series, Crane Model 1 Series, Powell Model 150, Hammond 1.413, Red White 211/212 or approved equal.
- B. Over 2 Inches: Iron body, bronze trim, rising stem and handwheel, OS&Y, plug-type disc, flanged ends. Red and White Fig 400 or NIBCO F718-B, Crane 351 or approved equal.

2.9 BALL VALVES:

- A. Up to 2 Inches: Bronze or stainless steel body, stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, solder threaded ends with union. Nibco Model 580 Series, Crane Model 2330 Series, Red White 5092/5095 or approved equal.
- B. Over 2 inches: Cast steel body, chrome plated steel ball teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

2.10 BUTTERFLY VALVES:

- A. Iron body, bronze disc, resilient replaceable seat for service to 180-degrees F, or lug end butterfly, 10 position over handle or infinite position lever handle with memory stop.

2.11 SWING CHECK VALVES:

- A. Up to 2 inches: Bronze 45 degree swing disc, solder or screwed ends. Nibco Model 413 Series, Crane Model 37 Series, Red White 236/237 or approved equal.
- B. Over 2 inches: Iron body, bronze trim, 45 degrees swing disc, renewable disc and seat, flanged ends. Red White 435, Nibco F918, Crane 373 or approved equal.

2.12 SPRING LOADED CHECK VALVES:

- A. Iron body, bronze trim, spring loaded, bronze disc, wafer.
- B. Red White 442, Nibco W920W, Stockham W6-970 or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Ream pipe and tube ends. Remove burrs. Bevel end Ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATIONS:

- 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 and fittings.
- G. Provide access where valves and fittings are not exposed.

- H. Slope water piping and arrange to drain at low points.
- I. Establish elevations of buried piping outside the building to insure not less than 3 feet of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- L. Establish invert elevations, slope all drainage piping 4 inches and larger to 1/8 inch per foot minimum. All drainage piping 3 inches and smaller shall be sloped to 1/4 inch per foot minimum.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide one plug cock wrench for each plug cock sized 2-1/2 inches and larger.
- P. In pipe 3 – inch nominal diameter or less, cleanouts shall be located at not more than 50ft.intervals
- Q. In pipe 4 – inches nominal diameter through 6 inches nominal diameter, cleanouts shall be located at not more than 80ft. intervals
- R. Each building drain shall be provided with a cleanout within 6ft. of the junction of the building drain and building sewer.

3.3 APPLICATION:

- A. Grooved mechanical couplings and fasteners not allowed.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe. All joints in potable lines to be lead free.
- D. Install gate, ball, butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe, ball, butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.

3.4 TEST

- A. Upon completion of the domestic water piping system, it shall be tested and proved tight under a water pressure not less than 200 psi. The water used for testing shall be obtained from a potable source of supply. This pressure test shall be performed before the disinfection of the domestic

water piping system is started. This test shall conform to the Louisiana State Plumbing Code

- B. Upon completion of the sanitary sewer piping system the contractor shall perform a water test to prove that the system is tight and with out leaks. No section of the piping system shall be tested with less than 10 ft head of water. The pressure shall be kept on the system for a time no less that 1 hour. This test shall conform to the Louisiana State Plumbing Code.
- C. Upon completion of the sanitary vent piping system the contractor shall perform a pressure test to prove that the system is tight and is with out leaks. This test shall conform to the Louisiana State Plumbing Code.
- D. Prior to any test, the contractor shall notify the Architect in writing a minimum of 5 business days, the date and time the test will take place. No exceptions. After the completion of the test but before the building is substantially complete the contractor shall submit a written report with the following information for each test performed.
 - 1. Project Name
 - 2. Project Location
 - 3. Plumbing Contractor Name, Address and Contact Information
 - 4. Identification of test performed.
 - 5. Time and Date test was started
 - 6. Time and Date test was completed.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM:

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Option 1: The system shall be filled with a solution containing 50 ppm of available chlorine and allowed to stand 6 hours before flushing and returning to service.
- C. Option 2: The system shall be filled with a solution containing 100 ppm of available chlorine and allowed to stand 2 hours before flushing and returning to service.
- D. Prior to the disinfection of the domestic water piping system the contractor shall inform the architect in writing the date and time the disinfection will take place. After the completion of the disinfection of the domestic water piping system but before the building is substantially completed the contractor shall submit a written report with the following information.
 - 1. Project Name
 - 2. Project Location
 - 3. Plumbing Contractors Name, Address, and contact information
 - 4. Chemicals used in the disinfection process.
 - 5. Time and Date disinfection process was started
 - 6. Time and Date disinfection process was completed

3.6 SERVICE CONNECTIONS:

- A. Provide new sanitary and storm sewer services and tie into existing as shown on plans. Before commencing work check invert elevations required for sewer connections, confirm inverts and

insure that these can be properly connected with slope for drainage and cover to avoid freezing. Contractor to tie in existing services as shown on drawings.

- B. Tie domestic water into existing services as shown on drawings. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Provide 18-gauge galvanized sheet metal sleeve around service main to 6 inches above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing. Contractor shall utilize and tie in existing water lines as indicated on the drawings.

END OF SECTION 22 10 00

SECTION 22 10 10 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Floor drains
- B. Trap Primers
- C. Cleanouts
- D. Backflow preventors
- E. Water hammer arrestors
- F. Hose bibbs hydrants

1.2 RELATED WORK

- A. Section 23 05 29 - Supports and Anchors
- B. Section 22 10 00 - Plumbing Piping
- C. Section 22 40 00 - Plumbing Fixtures

1.3 REFERENCES

- A. ANSI/ASSE 1012 - Backflow Preventers with immediate Atmospheric Cent.
- B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
- C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- E. ANSI A112.21.1 - Roof Drains
- F. ANSI A112.26.1 - Water Hammer Arrestors
- G. PDI WH-201 Water Hammer Arrestors

1.4 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00.
- B. Include component sizes, rough-in requirements, service sizes, and finishes.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

- A. Floor Drain (FD): ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, square adjustable nickel- bronze strainer, and trap primer connection; Wade model 1100G, Zurn model Z415s or Smith model 2005.
- B. All floor drains installed shall have trap primers.

2.2 TRAP PRIMERS

- A. Trap primers shall be PPP, Inc. Prime-Rite 500 with AG-500 air gap fitting. Distribution unit may be used for multiple floor drains. Trap primers shall be installed as per manufacturer recommendations and in strict accordance with the Louisiana Plumbing Code. Elastomeric flexible type trap guards will not be allowed on this project.

2.3 ROOF DRAINS

- A. Roof Drains (RD): Duco Cast Iron body with adjustable extension sleeve, reversible collar, combined flashing clamp, under deck clamp, and gravel stop, with cast iron dome. Coordinate outlet with storm sewer piping. Wade model 3000-ADF, Zurn model Z100, or Smith model 1015.

2.4 CLEANOUTS

- A. Exterior Surfaced Areas: As detailed on Plans.
- B. Interior Finished Floor Areas: Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel- bronze strainer, square with scoriated cover in service areas and square with depressed cover to accept floor finish in finished floor areas; Model W-6000 manufactured by Wade or Model ZN-1400 manufactured by Zurn or 4000 Series manufactured by Smith.
- C. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw; Model W-

8460-R manufactured by Wade or Model ZN-1445-1 manufactured by Zurn or Model 4532 manufactured by Smith.

- D. Interior Unfinished Accessible Areas: Caulked or threaded type, provide bolted stack cleanouts on vertical rainwater leaders.
- E. Acceptable Manufacturers
 - 1. Wade 6000
 - 2. Zurn 1400
 - 3. Substitutions: Under provisions of Instructions To Bidders.

2.5 BACKFLOW PREVENTERS

- A. Pressure Backflow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and Stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.
- B. Acceptable Manufacturers
 - 1. Watts Model 909
 - 2. Wilkins Model 375
 - 3. Substitutions: Under provisions of Instructions To Bidders.

2.6 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range - 100 to 300 degrees F (-73 to 49 Degrees C) and maximum 250 psig (1700 kpa) working pressure.
- B. Acceptable Manufactures
 - 1. Wade Model W-5, W-10, W-20
 - 2. Zurn Model Z-1700-100, 200, 300
 - 3. Smith Model 5000
 - 4. Substitutions: Under provisions of Instructions To Bidders.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate cutting forming of roof floor construction to receive drains to required invert elevations.

3.2 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Insure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install water hammer arrestors complete with accessible isolation valve.
- E. In pipe 3 – inch nominal diameter or less, cleanouts shall be located at not more than 50ft.intervals
- F. In pipe 4 – inches nominal diameter through 6 inches nominal diameter, cleanouts shall be located at not more than 80ft. intervals
- G. Each building drain shall be provided with a cleanout within 6ft. of the junction of the building drain and building sewer.

END OF SECTION 22 10 10

SECTION 22 40 00 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Plumbing Fixtures and Trim

1.2 RELATED WORK

- A. Section 23 00 00 - General Mechanical
- B. Section 22 10 00 - Plumbing Piping
- C. Section 22 10 10 - Plumbing Specialties

1.3 SUBMITTALS

- A. Furnish and install plumbing fixtures as shown on the accompanying drawing and in accordance with the approved rough-in drawings. This will include service sinks, lavatories, water closets, urinals, etc., with all brass in connection with supply tubing, traps, escutcheons, stop and basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated and in perfect condition.
- B. All brass must be best quality. All brass pipe to be seamless brass tubing and all fixture traps shall be heavy with C.O. plugs. Nipples shall be extra heavy. Lightweight goods will not be accepted. All exposed metal on fixtures shall be C.P. or Chromard. All "P" traps shall be complete with cleanout plug.
- C. Contractor shall submit in his fixture brochure for approval, a rough-in sheet of each fixture and indicate any variation required for the fixtures. Fixtures are to be roughed-in in accordance with these approved rough-in sheets and anchored so that piping cannot be moved.

1.4 JOB CONDITIONS

- A. Check millwork shop drawings. Conform location and size of fixtures and openings before rough-in and installation.

PART 2 – PRODUCTS – see plans

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install furnish and install all plumbing fixtures and accessories according to manufacturer's instruction and according to national, state and local codes governing the various systems. Carefully review the Architectural floor plans and millwork details to determine exact number of all fixtures, outlets, and accessories required. Coordinate all fixtures, outlets, drains, accessories, etc., prior to submitting shop drawings.
- B. Install each fixture in accordance with rough-in drawings as per manufacturers recommendations. At completion thoroughly clean plumbing fixtures and equipment. Anchor fixtures rigidly; anchor piping in walls so that piping cannot be moved.
- C. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers and escutcheons.
- D. Solidly attach floor water closets to floor with lag screws and finishing caps.
- E. Install each fixture with trap, easily removable for servicing and cleaning.
- F. All fixtures supplied with domestic water, hot or cold, shall be installed with integral stops on all supply lines.
- G. Mount fixtures to the following heights above finished floor:
 - 1. Water Closets:
 - a. Standard 15" to top of bowl rim
 - b. Handicapped 18" to top of seat
 - 2. Urinal:
 - a. Standard 22" to top of bowl rim
 - 3. Lavatories:
 - a. Handicapped 34" to top of basin rim
 - 4. Water Closet Flush Valves:
 - a. Standard 11" min. above bowl rim'
- H. Contractor shall caulk all joints at walls and floors with plumbing fixtures.
- I. Contractor shall provide approved ADA drain and water line insulation covers on all exposed services for lavatories and sinks. Truebro Lav Guard or approved equal.

3.2 FIXTURE ROUGH-IN SCHEDULE:

- A. Rough-in fixture piping and size connections shall be in accordance with the following table of minimum sizes for particular fixtures unless noted different on the drawing:

PLUMBING FIXTURE ROUGH-IN SCHEDULE

<u>DESCRIPTION</u>	<u>C.W.</u>	<u>H.W.</u>	<u>WASTE</u>	<u>VENT</u>
WATER CLOSET (TANK)	½"	—	4"	3"
WATER CLOSET (FLUSH VALVE)	1"	--	4"	3"

URINAL (FLUSH VALVE)	3/4"	--	2"	1-1/2"
LAVATORY	1/2"	--	2"	1-1/2"
SERVICE SINK	1/2"	1/2"	3"	2"
ELECTRIC WATER COOLER	1/2"	--	2"	1-1/2"
SINK	1/2"	1/2"	2"	1-1/2"
HOSE BIBB	3/4"	--	--	--
2" FLOOR DRAIN	--	--	2"	1-1/2"
3" FLOOR DRAIN	--	--	3"	2"
3" HUB DRAIN	--	--	3"	2"

WATER PIPE SIZING TABLE

UNLESS SHOWN OTHERWISE, DOMESTIC WATER LINES SHALL RUN CONCEALED OVERHEAD AS DESIGNATED IN PLUMBING FIXTURE SCHEDULE AND BE SIZED ACCORDING TO TABLE BELOW.

PLANS AND RISER DIAGRAMS DO NOT NECESSARILY SHOW ALL PIPING RUNS. INSTALL A FACTORY SHOCK ABSORBER AT TOP OF EACH FIXTURE GROUP AND ALSO AT WATER HEATERS.

<u>NUMBER OF FIXTURES*</u>	<u>PIPE SIZE (IPS)</u>
2 OR LESS	1/2"
3 TO 5	3/4"
6 TO 10	1"
11 TO 15	1-1/4"
16 TO 28	1-1/2"

*FLUSH VALVE WATER CLOSET IS EQUIVALENT TO SIX (6) FIXTURES SIZES INDICATED ABOVE ARE MINIMUM SIZES TO BE USED UNLESS OTHERWISE STATED

END OF SECTION 22 40 00

DIVISION 23
HEATING,
VENTILATING, AND
AIR CONDITIONING
(HVAC)

SECTION 23 05 23-VALVES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Butterfly Valves
- B. Check Valves
- C. Plug Valves
- D. Drain Valves
- E. Gate Valves
- F. Pet Cocks
- G. Ball Valves

1.2 RELATED WORK

- A. Section 23 21 13 - Hydronic Piping
- B. Section 23 21 23 - Pumps
- C. Section 23 21 16 - Hydronic Specialties

1.3 SUBMITTALS

- A. Submit copies of valve ordering schedule for approval prior to ordering valves.
- B. Submit detailed shop drawings under provisions of individual sections. Clearly indicate make, model, type, size, and pressure ratings, and materials of construction.

1.4 APPROVAL OF PRODUCT PRIOR TO BIDDING

- A. Refer to Instruction to Bidders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Certain items in this Specification are listed by manufacturer and/or manufacturer's model number to establish general style, type, character, and quality or product desired. Similar items manufactured by other than those listed will be considered, providing submittals are made according to Pre-Bid approval requirements of Instruction to Bidders.
- B. Where no manufacturer or model number are given, any product meeting performance or design criteria, or referenced trade association standard may be used and Pre-Bid Approval is not required.
- C. Provide valves of same manufacturer throughout wherever possible.
- D. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

2.2 VALVE CONNECTIONS

- A. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves.
- B. Thread pipe sizes 2 inches and smaller.
- C. Flange pipe sizes 2-1/2 inches and larger.
- D. Solder or screw to solder adapters for copper tubing.
- E. Provide butterfly valve with tapped lug body when used for isolating service.

2.3 BALL VALVES

- A. Ball valves 2" and smaller (heating coils) valves to be bronze body with stainless steel cartridge, threaded, combination valve and flow control. Control range 2-32 psid.
- B. Manufacturer's: NIBCO T-590-Y-66 or Red & White 5092
- C. Ball valves 3" and larger (chilled water) to be cast steel 150 lbs. psig flange type, ASTM A216, GR. WCB carbon steel, 416 stainless steel stem and ball, Teflon gasket, malleable iron handles.
- D. Manufacturer's: NIBCO F515 or Red & White 4151

2.4 CHECK VALVES

- A. Chilled Water, Hot Water:
Body: Cast iron ASTM A-48 Class 35
Seat: Bronze ASTM 145 Alloy
Disc: Bronze ASTM 145 Alloy
Spring: Stainless Steel Type 302
Bushing: 6" and smaller ASTM B-16 8" and larger ASTM 145
Set screws: Stainless Steel Type 304
Manufacturer's: NIBCO F-918-B or Red & White 435, B&G, Armstrong

2.5 BALANCING VALVES (Eccentric Plug Type)

- A. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard.
- B. Port areas for valves through 20" shall be minimum 80% of full pipe area and port areas of 24" and larger valves shall be minimum 70% of full pipe area.
- C. Valve bodies shall be of ASTM A126 Class B cast iron in compliance with AWWA C504 Section 2.2. Bodies in 3" and larger valves shall be furnished with a welded overlay seat of not less than 90% pure nickel in accordance with AWWA C507 Section 7.2. Valves utilizing resilient seat attached to the body shall not be acceptable. As per AWWA C504-80 Section 35.2 and AWWA C507-73 Section 7.2, sprayed or plated seats are not acceptable, nor shall screwed in seats be acceptable.
- D. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable, re-packable without removing the bonnet or actuator from the valve, and re-packable under pressure. Shaft seals shall conform to AWWA C504-80, Section 3.7 and AWWA C507-73, Section 10.2. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable. All exposed nuts, bolts, springs, washers zinc plated.
- E. Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 48". Each valve shall be given a hydrostatic and seat test.
- F. Where required, valves shall be capable of providing drip-tight shutoff up to the full rating with pressure in either direction.
- G. Acceptable Manufacturers
 - 1. Dezurik Series 100
 - 2. Alloyco 257A
 - 3. Nexus

2.6 DRAIN VALVES

- A. Bronze gate, class 125, ASTM B-62 with bronze wedge, hose cap and safety chain.
- B. Acceptable Manufacturer's
 - 1. NIBCO T-113-HC
 - 2. Crane 1701

2.7 PRESSURE RATINGS

- A. Unless otherwise indicated, use valves suitable for 150 minimum psig WSP and 450 degrees F and maximum 200 psig and 250 degrees F.

2.8 VALVE OPERATORS

- A. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide each plug cock sized 2-1/2 inches and larger with a wrench, with set screw.
- B. For butterfly valves (provide gear operators for sizes 8 inches and larger. For smaller sizes, provide lever lock handle with toothed plate for shut-off service and infinitely adjustable handle with lock nut and memory stop for throttling service.
- C. Provide valves located more than 8 feet from floor in equipment room areas with chain operated sheaves. Extend chains to 4 feet above floor and hook to clips arranged to clear walking aisles.
- D. All valves shall be furnished with valve stem extensions to facilitate insulation installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install butterfly valves for shut-off and isolating service, to isolate equipment, part of systems, or vertical risers.
- C. Provide spring-loaded check valves on discharge of condenser water chilled water, and hot water pumps.

END OF SECTION 23 05 23

SECTION 23 05 29 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and equipment hangers, supports, and associated anchors.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

1.2 RELATED WORK

- A. Section 23 07 00 - Piping and Equipment Insulation.
- B. Section 23 21 13 - Hydronic Piping.
- C. Section 22 10 00- Plumbing Piping

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00 – Administrative Requirements.
- B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S

- A. Fee and Mason
- B. Grinnel

2.2 PIPE HANGERS AND SUPPORTS

- A. Hangers for pipe sizes 1/2 to 1-1/2 inch: 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. 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.
- D. Vertical Support: Steel riser clamp.
- E. Floor support for pipe sizes 4 inches and over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roller for hot pipe 6 inches and over.
- F. Shields for insulated piping 2 inches and smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- G. All hangers to be sized to include insulation.

2.3 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.4 INSERTS

- A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

2.5 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel.
- B. Lead Flashing: 5 lb./sq. ft. sheet lead for waterproofing.
- C. Caps: Steel, 22 gauge minimum, 16 gauge at fire resistant elements.

2.6 SLEEVES

- A. Sleeves for pipes through non-fire rated floors: Form with 18 gauge galvanized steel.
- B. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors: Form with steel pipe or 18 gauge galvanized steel.

2.7 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for

continuous insulation wrapping.

- B. Design hangers without disengagement of supported pipe.

2.8 FINISH

- A. Prime coat exposed steel hangers and supports.
- B. Protect against galvanic action with dielectric unions for dissimilar metals.

PART 3 - EXECUTION

3.1 INSERTS

- A. Provide inserts to General Contractor 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 to be 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.
- F. Provide stainless steel clevis hangers attach to steel in slab for all underground sewer piping. Install every 5' and within 2' of each elbow.

3.2 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

PIPE SIZE DIAMETER	MAX HANGER SPACING	MIN. HANGER
1-1/2 TO 2 INCH	10' - 0"	3/8"
2-1/2 TO 3 INCH	10' - 0"	1/2"
4 to 6 inch	10' - 0"	5/8"
8 to 12 inch	10' - 0"	7/8"
14 to 20 inch	15' - 0"	1"

- 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. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- F. Support riser piping independently of connected horizontal piping.

3.3 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment bases of reinforced concrete as detailed on plans.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Provide rigid anchors for pipes after vibration isolation components are installed.

3.4 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

END OF SECTION 23 05 29

SECTION 23 05 48 - VIBRATION ISOLATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Inertia Bases
- B. Vibration Isolation

1.2 RELATED WORK

- A. Fire Protection System
- B. Plumbing System
- C. HVAC System

1.3 REFERENCES

- A. ASHRAE - Guide to Average Noise Criteria Curves.

1.4 QUALITY ASSURANCE

- A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00– Administrative Requirements.
- B. Indicate vibration isolator locations, with static and dynamic load on each, on shop drawings and described on product data.
- C. Submit manufacturer's installation instructions.

1.6 CERTIFICATES

- A. Submit manufacturer's certificate that isolators are properly installed and properly adjusted to meet or exceed specified requirements.

PART 2 - PRODUCTS

2.1 INERTIA BASES

- A. Pumps: Reinforced 3,000 psi concrete base with chamfered edges, without channel frame.

2.2 VIBRATION ISOLATORS

- A. A.H. Units: Open spring mount with stiff springs. Horizontal stiffness equal to vertical stiffness. Minimum 1" deflection. No. and size of springs as per A.H. unit manufacturer's recommendations.
- B. Color code spring mounts.
- C. Select springs to operate at $\frac{2}{3}$ maximum compression strain, with $\frac{1}{4}$ inch (6 mm) ribbed neoprene pads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install vibration isolators for motor driven equipment.
- B. Set steel bases for one inch clearance between housekeeping pad and base. Set concrete inertia bases for 2 inch (50 mm) clearance. Adjust equipment level.
- C. Provide spring isolators on piping connected to isolated equipment as follows: Up to 4 inch diameter, first three points of support; 5 to 8 inch diameter, first four points of support; 10 inch diameter and over, first six points of support. Static deflection of first point shall be twice deflection of isolated equipment.

END OF SECTION 23 05 48

SECTION 23 05 53 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Identification of all mechanical products installed under this Division.

1.2 RELATED WORK

- A. Section 09 90 00 - Painting: Identification painting.

1.3 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 01 30 00– Administrative Requirements.
- B. Mechanical and plumbing contractors shall coordinate color codes and marking procedures.

1.5 APPROVAL OF PRODUCT PRIOR TO BIDDING

- A. Refer to Instructions to Bidders, Page IB-3, Paragraph 4.3 Substitution.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Metal Tags: Brass with stamped letters, tag size minimum 1-1/2 inch (38 mm) diameter with smooth edges.
- D. Stencils: With clean cut symbols and letters of following size:

OUTSIDE DIAMETER OF INSULATION OF PIPE	LENGTH OF COLOR FIELD	SIZE OF LETTERS
3/4" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2 - 1/2"
Over 10"	32"	3 - 1/2"
Ductwork & Equipment	-----	2 - 1/2"

- E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing printed markings.
- F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6" wide by 4 mil thick manufactured for direct burial service.

PART 3 - EXECUTION

3.1 PREPARATION AND INSTALLATION:

- A. Degrease and clean surfaces to receive adhesive for identification material.

3.2 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.
- B. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- C. Plastic type Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- D. Underground Plastic Pipe Markers: Install 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- E. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks and water treatment devices, and motor starters with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tags.
- F. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- G. Valves: Identify valves in main and branch piping with tags.
- H. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Tags may be used on

small diameter piping. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side penetration of structure or enclosure, and at each obstruction.

3.3 PAINTING

- A. All surfaces requiring painting shall be left clean by the Mechanical Subcontractor. All painting shall be done by the General Contractor's painting Subcontractor. All exposed piping or insulation, convectors, grilles, or fans, in building or on roof will be painted. Paint pipe, equipment, hangers and accessories in Equipment Rooms including covering and foundations with two (2) coats of approved paint after thoroughly cleaning. Equipment having factory finish shall be touched up and given one (1) additional coat of machinery enamel color as selected. The above shall be done by the General Contractor. See Section 09 90 00.
- B. All piping in all equipment rooms shall be identified with pipe markers with directional arrows. The following color code shall be followed.

LEGEND	PIPING	DIRECTIONAL MARKER	BAND COLOR BACKGROUND
Domestic Water	Green	Green	White
Chilled Water	Blue	Green	Blue

NOTE: All colors to be coordinated with WBR Parish School System prior to ordering.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENT

- A. All division 23 specification sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

1.2 SCOPE OF WORK

- A. The Contractor shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s).
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.
- C. Representatives of the Test and Balance Company shall visit the job site during installation of the HVAC equipment, piping and ductwork as required.
- D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.
- E. The test and balance report complete with a summary page listing all deficiencies shall be submitted to the Architect for review by his Mechanical Engineer. If the Mechanical Engineer agrees with the report, he shall sign it and return it to the Architect. The test and balance report must be complete and must be accepted by the Mechanical Engineer prior to acceptance of the project. Any outstanding test and balance items shall be placed on the punch list and a monetary value shall be assigned to them.
- F. After all deficiencies have been corrected the Mechanical Engineer shall sign the testing and balancing report, and the Test and Balance Company shall supply four (4) copies of the final and

complete report to the Architect for inclusion in the Operation and Maintenance Manuals.

- G. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

HYDRONIC SYSTEMS:

Pumps
System Mains and Branches
Heat Exchangers
Coils
Control Valves

AIR SYSTEMS

Supply Fans
Zone, Branch, & Main Ducts
VAV System
Diffusers, registers, & grilles
Coils

1.3 DEFINITIONS, REFERENCES, STANDARDS

- A. All work shall be in accordance with the latest edition of the Associated Air Balance Council (AABC) National Standards or the latest standards of the National Environmental Balancing Bureau (NEBB). If these contract documents set forth more stringent requirements than the AABC National Standards or the NEBB Standards, these contract documents shall prevail.

1.4 QUALIFICATIONS

- A. Agency Qualifications: The TAB Agency shall be a current member of the AABC or the NEBB and must be in good standing with FP&C. A list of these firms shall be obtained from FP&C. Falsification of a TAB report shall be grounds for removal from the FP&C list and the firm's actions shall be reported to the appropriate certification agency. The contractor may use any FP&C approved TAB firm on a state project.

1.5 SUBMITTALS

- A. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.
- B. Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards or the NEBB Standards.

1.6 TAB PREPARATION AND COORDINATION

- A. Shop drawings, submittal data, up-to-date revisions, change orders, fan curves, pump curves and other data required for planning, preparation, and execution of the TAB work shall be provided when available and no later than 30 days after the Designer has returned the final approved submittal data to the Contractor.
- B. System installation and equipment startup shall be complete prior to the TAB agency's being notified to begin.

- C. The building control system (BCS) contractor shall provide and install the control system, including all temperature, pressure and humidity sensors. These shall be calibrated for accurate control. If applicable, the BCS contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.
- D. All test points, balancing devices, identification tags, etc., shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- E. Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.

1.7 REPORTS

- A. Final TAB Report - The TAB agency shall submit the final TAB report for review by the Architect. On plans provided, all outlets, devices, HVAC equipment, etc., shall be identified (including manufacturer, model number, serial number, motor manufacturer, HP, drive type, fan and motor sheaves and belt number), along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" (or similar NEBB Guaranty) assuring that the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards (or similar NEBB Standards). The Designer shall certify his approval on the Performance Guaranty.
- B. Submit 4 copies of the Final TAB Report to the Architect for inclusion in the Operation and Maintenance Manuals.

PART 2 - INSTRUMENTATION

- A. All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards (or similar NEBB Standards).

PART 3 - EXECUTION

3.1 GENERAL

- A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards (or similar NEBB Standards). Adjustment tolerances shall be + or - 10% unless otherwise stated.
- B. Equipment settings, including manual damper quadrant positions, valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.

- C. All information necessary to complete a proper TAB project and report shall be per AABC or NEBB standards unless otherwise noted. The descriptions of work required, as listed in this section, are a guide to the minimum information needed.
- D. TAB contractor shall cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. Upon completion, patch insulation, ductwork and housings using materials identical to those removed. Seal insulation to reestablish integrity of the vapor barrier.
- E. TAB work shall include additional inspection and adjustment of components during the season following the initial balance to include re-balance of any items influenced by seasonal changes or as directed by the Owner.

3.2 AIR SYSTEMS

- A. The TAB agency shall verify that all ductwork, splitters, extractors, dampers, grilles, registers, and diffusers have been installed per design, are functional and set full open. Any leakage in the ductwork shall be repaired prior to the test. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards or NEBB Standards:

For supply fans:

- 1. Fan speeds - Test and adjust fan RPM to achieve design CFM requirements.
- 2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
- 3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
- 4. Outside Air - Test and adjust the outside air on applicable equipment using a Pitot-tube traverse. If a traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. If a traverse is not practical use the mixed-air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between Pitot-tube traverses of the supply and return air ducts.
- 5. Static Pressure - Test and record system static pressure, including the static pressure profile of each supply fan.

For exhaust fans:

- 1. Fan speeds - test and adjust fan RPM to achieve design CFM requirements.
- 2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
- 3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main exhaust ducts to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
- 4. Static Pressure - Test and record system static pressure, including the static pressure profile of each exhaust fan.

For zone, branch and main ducts:

1. Adjust ducts to within design CFM requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

For VAV systems:

1. Identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.
2. Test, adjust and record the maximum and minimum box air quantities for each VAV box.
3. Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.
4. Test and record entering and leaving air temperature of hot water coils with full heating air flow and water flow.
5. Insure the entering static pressure is sufficient for normal, proper box operation.

For diffusers, registers and grilles:

1. Tolerances - Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts. Include required CFM, initial test CFM and final CFM.
2. Identification - Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

For coils:

1. Air Temperature - Once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

3.3 HYDRONIC SYSTEMS

- A. The TAB agency shall, as applicable, verify that all hydronic equipment, piping, and coils have been filled and purged; that strainers have been cleaned; and that all balancing valves (except bypass valves) are set full open. Examine water in system and determine if it has been treated and cleaned. As applicable, it shall check air vents and expansion or compression tank for proper operation. The TAB agency shall perform the following testing and balancing functions in accordance with the AABC National Standards (or similar NEBB Standards):

For pumps:

1. Test and adjust, hot water, pump to meet design GPM requirements. Check pump rotation and verify impeller size. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Record appropriate gauge readings for final TDH and Block-Off/Dead head calculations. List pump N.P.S.H. (as applies).
2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure pump motor is not in or above the service factor.

For system mains and branches:

1. Adjust water flow in pipes to within design GPM requirements. As applicable, at least one branch balancing valve shall be completely open.

For heat exchangers:

1. Verify that heat exchangers have been filled and started by others, and are in operation.
2. Current and Voltage - As applicable, test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
3. Test and adjust water flow through heat exchangers.
4. Test and record entering and leaving temperature and pressure profiles of water or steam heat exchangers.

For coils:

1. Tolerances - Test, adjust, and balance all chilled-water and hot-water coils within 10% of design requirements.
2. Verification - Verify the type, location, final pressure drop and GPM of each coil. This information shall be recorded on coil data sheets.

For control valves:

1. Check operation of automatic valves.
2. Test and record pressure drop and flow across control valves at full flow.

3.4 PROCEDURES FOR CHILLERS

- A. Balance water flow through each evaporator to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:
 1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
 2. If water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
 3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
 4. Power factor if factory-installed instrumentation is furnished for measuring kilowatt.
 5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatt.
 6. Capacity: Calculate in tons of cooling.

3.5 ADDITIONAL TAB SERVICES

- A. Job Site Inspections: During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems as required.
- B. Verification of HVAC Controls: The TAB agency shall be assisted by the building control systems Contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:
 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions.

- C. Temperature Testing: To verify system control and operation, a series of three temperature tests shall be taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.
- D. TAB Report Verification: At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.

END OF SECTION 23 05 93

SECTION 23 07 00 - PIPING AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Piping Insulation
- B. Jackets and Accessories
- C. Equipment Insulation
- D. Duct Insulation

1.2 RELATED WORK

- A. Section 23 31 00 – Ductwork
- B. Section 22 10 00 – Plumbing Piping

1.3 REFERENCES

- A. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation
- B. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- C. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate
- D. ASTM E845 - Surface Burning Characteristics of Building Materials.
- E. NFPA 255 - Surface Burning Characteristics of Building Materials.
- F. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in application of piping insulation.
- B. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with ASTM E84, NFPA 255.0, UL 723.

1.5 SUBMITTALS

- A. Submit product data for each application as per Section 01 30 00– Administrative Requirements.
- B. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 INSULATION

- A. After all work has been tested and found to be leak free and tight, and accepted by the Architect, insulate as follows:
 - 1. All chilled water, supply and return, piping above ground shall be covered with 2" thick molded cellular foam, foamglas or cell-u-glass type sectional pipe covering to be complete with F.R.J. jacket, with the exception of hot water run-outs - see item No. 2. Sections of covering shall be joined together, the mastic to be buttered on only one of the two adjoining surfaces at both the longitudinal and circumferential joints so that a complete seal at the joints is obtained. The piping insulation is to be secured in place with copper wire spaced not more than 12" on center.
 - 2. All heating water, supply and return, piping above ground shall be covered with 1- ½" thick molded cellular foam, foamglas or cell-u-glass type sectional pipe covering to be complete with F.R.J. jacket, with the exception of hot water run-outs – see item No. 2. Sections of covering shall be joined together, the mastic to be buttered on only one of the two adjoining surfaces at both the longitudinal and circumferential joints so that a complete seal at the joints is obtained. The piping insulation is to be secured in place with copper wire spaced not more than 12" on center.
 - 3. All domestic hot and cold piping above ground shall be covered with 1" thick fiberglass, molded type sectional pipe covering complete with FRJ jacket. Sections of pipe covering shall be joined together, the mastic to be buttered on only one of the two adjoining surfaces at both the Longitudinal and circumferential joints so that a complete seal at the joints is obtained. The piping insulation will be secured in place with copper wire spaced not more than 12 on center. All domestic water piping insulation shall be continuous. Contractor shall not cut insulation to fit around structural items. No exceptions.
 - 4. Insulate the square to round connections on each air handling unit with 3" thick 3/4 lb. density insulation board using stick pins randomly spaced 18" apart. Insulation board shall have aluminum vapor barrier.
 - 5. Fittings, flanges, valves, etc., shall be covered with molded or fabricate covers of same material as pipe covering and shall be finished with two (2) coats of white vapor barrier mastic reinforced with 20-20 mesh glass fabric.
 - 6. Insulate all VAV boxes, supply, return, exhaust, and fresh air ducts with 3" thick 3/4 lb. density fiberglass insulation with reinforced aluminum vapor barrier. Seal all joints with duct tape.
 - 7. All round and flat oval supply air ducts shall be wrapped with 3" thick, 3/4 lb. density fiberglass insulation with reinforced aluminum vapor barrier. Seal all joints with 2" duct tape.
 - 8. Insulate cooling coil condensate drain lines from air handling units with 1/2" thick aerotube type insulation tied on and sealed over with tape.
 - 9. Insulate back of all ceiling diffusers with 3" thick fiberglass with reinforced aluminum vapor

- barrier.
10. All chilled heating and water valves, and hot water pumps shall be insulated with a factory fabricated removable cover. Cover shall be fabricated of 1" close cell elastomeric insulation complete with Velcro closures.
 11. Insulate all horizontal roof drains with 2" thick $\frac{3}{4}$ lb. density fiberglass insulation with reinforced aluminum vapor barrier. Seal all joints with duct tape.
 12. All outdoor mechanical piping shall be covered with aluminum jacket, water tight.
 13. All external duct work must be externally insulated and double wall. Seal water tight.
 14. All exterior ductwork and ductwork run in attic spaces shall be wrapped with 3" thick, $\frac{3}{4}$ lb. density fiberglass insulation with reinforced aluminum vapor barrier.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install materials in accordance with manufacturer's instructions.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Continue insulation with vapor barrier through penetrations.
- C. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Neatly finish insulation at supports, protrusions, and interruptions.

END OF SECTION 23 07 00

SECTION 23 09 00 - INTEROPERABLE FACILITY MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 OVERVIEW

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating temperature control system, utilizing Direct Digital Controls, electronic interfaces and actuation devices, as shown on the drawings and as described herein. Drawings are diagrammatic only. Equipment and labor not specifically referred to herein or on the plans, that is required to meet the functional intent, shall be provided without additional cost to the Owner. Performance and capabilities are based on ASI DDC approved products.

1.2 INSTALLATION

- A. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the temperature control system manufacturer or its exclusive factory authorized installing contracting field office (representative). The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the manufacturer. Supervision, calibration and checkout of the system shall be by the employees of the local exclusive factory authorized temperature control contracting field office (branch or representative).

1.3 MANUFACTURER

- A. Must be ASI DDC control and integrate seamless into existing system.

1.5 SHOP DRAWINGS/SUBMITTALS

- A. Eight copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation as well as a hard copy graphical depiction of the application control programs shall also be included with the submittal package.
- B. Upon completion of the work, provide a complete set of drawings and application software on disk media. Drawings shall be provided as AutoCAD or ViSiO compatible files.

1.6 MATERIALS

- A. All materials and equipment used shall be standard components, of regular manufacture for this application. All systems and components shall have been thoroughly tested and proven in actual use. Products shall be BACNet Testing Lab (BTL) approved for this application. Products manufactured by other companies shall not be considered. Exceptions to the specification will qualify the bid as unacceptable.

1.7 WARRANTY

- A. The temperature contractor shall provide a one-year warranty.
- B. The temperature control contractor's office shall be within a 50-mile radius of the job site.
- C. The contractor shall respond to the job site emergency calls within a reasonable amount of time during normal working hours.

1.8 SOFTWARE LICENSE AGREEMENT

- A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

1.9 AGENCY AND CODE APPROVALS

- A. All products of the BAS shall be provided with the following agency approvals. With the submittal documents, verification that the approvals exist for all submitted products shall be provided. Systems or products not currently offering the following approvals are not acceptable.
UL-916; Energy Management Systems.
ULC; UL - Canadian Standards Association
FCC, Part 15, Subpart J, Class A Computing Devices
- B. All products shall be labeled with the appropriate approval markings. System installation shall comply with NFPA, NEMA, Local and National codes.
- C. The FMCS manufacturer shall provide documentation supporting compliance with ISO-9001 certification mark from applicable registrar.

PART 2 - FACILITY MANAGEMENT CONTROL SYSTEM

2.1 GENERAL

- A. The Facility Management Control System (FMCS) shall be comprised of a network of

interoperable, stand-alone digital controllers

2.2 SPECIFICATION NOMENCLATURE

- A. FMCS Facility Management Control System
- B. IDC Interoperable Digital Controller
- C. IBC Interoperable BACNet Approved Controller
- D. GDC Gateway Digital Controller
- E. GP Graphical Programmer
- F. HMI Human Machine Interface
- G. GUI Graphical User Interface

PART 3 - OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

3.1 NETWORK

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system under each internet server. The FMCS requires the incorporation of BACNet Technologies.

3.2 NAC

- A. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
 - 1. Calendar functions
 - 2. Scheduling
 - 3. Trending
 - 4. Alarm monitoring and routing
 - 5. Time synchronization
 - 6. Integration of LONWorks controller data and BACNet controller data
 - 7. Network Management functions for all LONWorks based devices
- B. The Network Area Controller must provide the following hardware features as a minimum:
 - 1. One Ethernet Port - 10Mbps
 - 2. One RS-232 port
 - 3. One LONWorks Interface Port - 78KB FTT - 10A or one MSTP Port
 - 4. Battery Backup
 - 5. Flash memory for long term data backup (If battery or flash memory is not supplies, the

- controller must contain a hard disk with at least 1 gigabyte storage capacity)
 - 6. The NAC must be capable of operation over a temperature range of 0 to 55C
 - 7. The NAC must be capable of withstanding storage temperatures of between 0 and 70C
 - 8. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing
 - 9. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data mechanism to read and write data stored within it.
 - 10. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
- C. The NAC shall provide alarm recognition, storage, routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
- 1. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
 - 2. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
 - 3. Provide timed (schedule) routing of alarms by class, object, group, or node.
 - 4. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
 - 5. Control equipment and network failures shall be treated as alarms and annunciated.
 - 6. Alarms shall be annunciated in any of the following manners as defined by the user:
 - 7. Screen message text
 - 8. Pagers via paging services that initiate a page on receipt of email message
 - 9. Graphic with flashing alarm object(s)
 - 10. Printed message, routed directly to a dedicated alarm printer
 - 11. The following shall be recorded by the NAC for each alarm (at a minimum):
 - 12. Time and date
 - 13. Location (building, floor, zone, office number, etc.)
 - 14. Equipment (air handler#, access way, etc.)
 - 15. Acknowledgment time, date and user who issued acknowledgment.
 - 16. Number of occurrences since last acknowledgment.
 - 17. Alarm actions may be initiated by user defined programmable objects created for that purpose.
 - 18. Defined users shall be given proper access to acknowledgment any alarm, or specific types or classes of alarms defined by the user.
 - 19. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.
 - 20. Provide a "query" feature to allow review of specific alarms by user defined parameters.
 - 21. A separate log for system alerts (controller failures, network failures, etc.) Shall be provided and available for review by the user.
 - 22. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.
- D. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

1. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
 2. Designating the log as interval or deviation.
 - a. For interval logs, the object is configured for the time of day, day of week and the sample collection interval.
 - b. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 3. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
 4. Each log shall have the ability to have its data cleared on a timed-based event or by a user-defined event or action.
 5. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.
 6. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
 7. All log data shall be available to the user in the following data formats:
 - a. HTML
 - b. XML
 - c. Plain Text
 - d. Comma or tab separated values
 8. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
 9. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:
- E. The GUI shall run on Microsoft Windows XP Professional or later.
1. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
 2. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
 3. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphical background, the GUI shall support the use of scanned pictures.
 4. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
 5. Graphics shall support layering and each graphic object is configurable for assignment to one a layer. A minimum of six layers shall be supported.
 6. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.

7. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
8. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
9. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
10. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
11. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
 12. Create, delete or modify control strategies.
 13. Add/delete objects to the system.
 14. Tune control loops through the adjustment of control loop parameters.
 15. Enable or disable control strategies.
 16. Generate hard copy records or control strategies on a printer.
 17. Select points to be alarmable and define the alarm state.
 18. Select points to be trended over a period of time and initiate the recording of values automatically.
19. On-Line Help. Provide a context sensitive, on-line system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
20. Security. Each operator shall be required to logon to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.
21. System Diagnostics. The system shall monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
22. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledgment the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
23. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

PART 4 – WEB BROWSER CLIENTS

4.1 WEB BROWSER CLIENTS

- A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer or Netscape Navigator. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.
- C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology by the Graphical User Interface. Systems that require different views or that require means of interfacing with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
 - 1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
 - 3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
 - 4. Storage of the graphical screens shall be in the Network Area Controller (NACS), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
 - 5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
 - 6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - 7. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
 - 8. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - 9. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - 10. Commands to start and stop binary objects shall be done by right-clicking the selecting the appropriate command from the pop-up menu. No entry of text shall be required.
 - 11. View logs and charts
 - 12. View and acknowledge alarms
 - 13. Setup and execute SQL queries on log and archive information
 - 14. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

15. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

4.2 SYSTEM PROGRAMMING

- A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through access as assigned by the system administrator. The GUI shall include graphics generation of all HVAC equipment with values and status displayed. The graphics shall be a graphical representation of each piece of equipment being controlled and shall be recognizable as the piece of equipment it is representing. The graphics shall be submitted to owner and engineer for approval prior to installation.
- B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide “real-time” data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.
- C. Programming Methods
 1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user’s application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
 2. Configuration of each object will be done through the object’s property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
 3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
 4. All programming shall be done in real-time. Systems requiring the uploading, editing and downloading of database objects shall not be allowed.
 5. The system shall support object duplication within a customer’s database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

4.3 NETWORK MANAGEMENT

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LONWorks or BACNet network management tools for working with LONWorks or BACNet networks. These tools shall manage a database for all devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between devices, known as “binding”. Systems requiring the use of third party network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The Network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to “learn” an existing LONWorks or BACNet network, regardless of what network management tool(s) were used to install the existing LONWorks or BACNet devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Network Area Controller (NACS), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

4.4 OBJECT LIBRARIES

- A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.
- B. The objects in this library shall be capable of being copied and pasted into the user’s database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
- D. All control objects shall conform to the control objects specified in the BACNET specification.
- E. The library shall include applications or objects for the following functions, at a minimum:
 - 1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACNET specification, providing 7-day plus holiday and temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on/off events.
 - 2. Calendar Object. The calendar must conform to the calendar object as defined in the

- BACNET specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical “point-and-click” selection. This object must be “linkable” to any or all scheduling objects for effective event control.
3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals.
 4. Temperature Override Object. Provide a temperature override that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) To maintain occupant comfort or for equipment freeze protection.
 5. Start-Stop Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building’s “flywheel” effect for energy savings. Provide automatic tuning of all start-stop time object properties based on the previous day’s performance.
 6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.
- F. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NACS). At a minimum, provide the following as part of the standard library included with the programming software:
1. LONMark/LONWorks & BACNet devices. These devices shall include, but not be limited to, devices for control of lighting, access, and metering. Provide LONMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LONMark profile shall be supported. Information (type and function) regarding network variables not defined in the LONMark profile shall be provided by the device manufacturer.
 2. For devices not conforming to the LONMark or BACNet standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file and documentation for the device to facilitate device integration.

4.5 GRAPHICAL USER INTERFACE COMPUTER HARDWARE (DESKTOP)

Workstation Server Hardware Station: IBM-compatible microcomputer with minimum configuration as follows:

- A. Processor: Intel Pentium IV, 1.2 GHz., or faster.
- B. Random-Access Memory: 4 GB., minimum.
- C. Graphics: Super video graphic adapter (SVGA), minimum 1024 x 768 pixels, 2.0-MB EDO video memory.
- D. Monitor: 21 inches minimum, noninterlaced, color, with maximum 0.28-mm dot pitch.
- E. Keyboard: QWERTY, 105 keys in ergonomic shape.
- F. Hard-Disk Drive: 200.0 GB., minimum.
- G. DVD-RW-ROM Drive: 12x max. variable DVD-ROM with software decoding.
- H. Mouse: Two button.

PART 5 - INTEROPERABLE CONTROLLERS

5.1 GENERAL

- A. BACNet (IBC) Interoperable Controllers
 - 1. Controls shall be microprocessor based Interoperable BACNet Controllers, bearing the applicable BTL logo on each product delivered. IBC shall be provided for AHU's, Fan Coils, VAV Terminal Boxes and other applications as shown on the drawings. IBC's shall be based on ASHRAE – 135 interoperability.
 - 2. To simplify controls and mechanical service troubleshooting, the IBC shall be mounted directly in the control compartment of the unitary system. The IBC shall be provided with a sheet metal or polymeric enclosure that is constructed of material allowing for the direct mounting within the primary air stream, as defined by UL-465. The direct mounting shall allow all controls maintenance and troubleshooting to be made while at the unitary equipment.
 - 3. The IBC'S shall communicate with the SDC at a baud rate of not less than 78.8K baud. The IBC shall provide LED indication of communication and controller performance to the technician without cover removal.
 - 4. The IBC shall be fully supported and communicate with any and all GUI(s) on the bus.
- B. IC Sensor
 - 1. The IC Sensor shall connect directly to the IBC and shall not utilize any of the I/O points of the controller. The IC Sensor shall provide a two-wire connection to the controller that is polarity and wire type insensitive. The IC Sensor shall provide a communications jack for connection to the communication trunk to which the controller is connected. The IC Sensor, the connected controller, and all other devices on the bus shall be accessible by the Graphical Programming tool.

2. The IC Sensor shall be supplied in the following variations;
 - a. Tamper-resistant (no display)
 - b. Tamper-resistant with tenant override
 - c. Basic user functions (LCD display and setpoint adjustment and tenant override)
 - d. Full user functions (LCD display and network-variable access and tenant override)
 - e. ASHRAE 95 compliance (LCD display and sub-base functionality)
3. The IC Sensor shall be provided in a modular configuration that allows for the rough in of all wiring without the presence of the electronics or esthetic covering. The IC Sensor shall allow for the customization of the color on the esthetic covering as a standard offering. User interface with the IC Sensor shall be provided as a configurable function by the FMCS, and shall offer password protection for access to network variable editing. Multiple network variables shall be accessible and editable by the IC Sensor. Icons shall be utilized to represent sensor and controller function status, affording independence from a single language for use interface. All IC sensors shall monitor and display space temperature and humidity.

5.2 IBC FUNCTIONALITY

A. IBC Functionality

1. The IBC shall provide a -40 to 140 degree F ambient operating temperature range. The IBC shall be provided in a modular configuration that allows for the rough in of all wiring without the presence of any of the IBC electronics. IBC devices that require the electronics to be present at the time of wiring, will require an additional controller to be provided for every 10 devices on the drawings, to allow for the preconfiguration and storing for service purposes.
2. All input/output signals shall be directly hardwired to the controller. For all-non-VAV terminal applications, a minimum of two input points of the IBC shall employ a universal configuration that allows for flexibility in application ranging from dry contact, resistive, to voltage/current sourced inputs. If universal points are not available, a minimum of two input points (each) of the dry contact, resistive and analog voltage/current types must be provided on every controller. The outputs of the IBC shall be of the relay and type. IBC devices utilizing non-relay outputs shall provide an interface relay for all points. All analog outputs shall be programmable for their start points and span to accommodate the control devices. Configuration of all I/O points shall be accomplished without physical hardware jumpers, switches or settings. Troubleshooting of input/output signals shall be easily executed with the Graphical Programming tool (GP) or a volt-ohm meter (VOM). All I/O points shall be utilized by the local IBC or shall be available as I/O points for other controllers throughout the network.
3. All IBC's shall be fully application programmable and shall at all times maintain their BTL certification. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IBC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
4. The IBC shall be provided with the ability to interface with the Graphical Programming tool. The interface port shall be provided at the wall sensor or within the unitary equipment, as specified on the plans. The interface port shall allow the GP to have full functionality as described in GP section of this specification. Through the connected controller all IBC

devices shall be accessible by the Graphical Programming tool.

PART 6 - OTHER SYSTEM HARDWARE

6.1 OTHER SYSTEM HARDWARE

- A. Control Valves: Control system contractor shall be responsible for selection of the proper control valves including line size, pressure rating, flow-coefficient, shut-off rating and allowable leakage factor. Modulating water valves shall be sized for nominal 4 psi maximum pressure drop. All chilled water valves shall be two-way with the exception of the chilled water valve on AHU-3 which is a 3-way valve and all hot water valves shall be 3-way modulating with linear throttling plug. Valve stems shall be silicone brass or stainless steel.
- B. Wall Mount Room Thermostats: Each room thermostat shall provide temperature indication to the digital controller; provide the capability for a software-limited set point adjustment and operation override capability. And integral LCD shall annunciate current room temperature and set point as well as override status indication. In addition, the thermostat shall include a port for connection of the portable operator's terminal described elsewhere in this specification.
- C. Duct Mount and Outside Air Temperature Sensors: 1000ohm RTD temperature sensors with an accuracy of 0.2 degrees C. Outside air sensors shall include an integral sun shield.
- D. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (Sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.
- E. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. All external wiring shall be connected to terminal strips mounted within the panel. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels. A complete set of "as-built" control drawings (relating to the controls within that panel) shall be furnished within each control panel.
- F. Humidity Sensors: Accuracy shall have an accuracy of 3% minimum.
- G. Air Flow Measuring Station: Furnish air flow measuring station which utilizes thermal dispersion technology with a minimum of 2 sensing points. Station shall be Ebtron Model ST series or prior approved equal.
- H. Differential pressure transmitter: Shall be equipped with a local display. The range shall be selected so that the anticipated setpoint shall be midrange. Transmitters for chilled water and hot water applications shall have a bypass manifold for serving.
- I. CO2 transmitter: CO2 transmitters shall have a range from 0 to 2000ppm and shall be accurate to $\pm$ 5% of reading.
- J. Flow transmitter: Shall be a dual turbine flow meter as manufactured by Onicon.

PART 7 - SEQUENCE OF OPERATION

7.1 VAV UNITS:

- A. System shall be started and stopped from the FMCS when the starter H-O-A switch is in the auto position. All safety controls shall stop the unit regardless of which position the H-O-A switch is in.
- B. Discharge air temperature sensor shall transmit temperature to the local panel of FMCS. FMCS shall modulate cooling coil 2-way valve to maintain setpoint (adjustable at GUI).
- C. Return air humidity shall be transmitted to the local panel of the FMCS. The FMCS shall open the chilled water valve 100% when the return air humidity rises above setpoint (Adjustable at GUI).
- D. A manual reset high limit static pressure controller located at the air handling unit will stop the fan on a rise in static pressure above its setpoint.
- E. A high limit thermostat located in the unit return air will stop the fan on a rise in temperature above its setpoint. Thermostat shall be set at 125 degrees F and require a manual reset. Smoke detector shall stop the fan through the fire alarm system.
- F. Smoke dampers shall open when the air unit supply fan is energized and closed when the supply fan is de-energized or as commanded by the fire alarm system.
- G. Return Air CO2 and outside air CFM shall be transmitted to the local panel of the FMCS. FMCS shall modulate the outside air and return dampers to maintain the minimum required outside air CFM and to keep the CO2 levels below 700ppm. (adjustable at GUI).
- H. A differential pressure transmitter located 2/3 down the longest duct run shall transmit duct static pressure to the local panel of the FMCS. FMCS shall modulate the VFD to maintain set point. .

7.2 VAV TERMINAL BOXES WITH ELECTRIC HEAT

- A. The VAV boxes shall only operate when its associated air unit is operating. As temperature rises, box damper shall modulate open to maintain setpoint. As temperature drops below setpoint the VAV box shall maintain its minimum CFM setpoint. Upon a further drop in temperature stages of electric heat shall be energized to maintain set point.
- B. During unoccupied periods the heating and cooling setpoints shall be reset to the unoccupied heating and cooling setpoints which are individually adjustable at the GUI. Each VAV Box thermostat will include an override button. The duration of override shall be individually adjustable at the GUI. Each VAV Box shall have an individual schedule and this schedule shall be adjustable at the GUI. Master schedules (maximum of 4) shall be programmed by this contractor to control the VAV Boxes in groups.

7.3 KITCHEN ROOF TOP UNIT:

- A. System shall be started and stopped from the FMCS when the starter H-O-A switch is in the auto position. All safety controls shall stop the unit regardless of which position the H-O-A switch is in.
- B. Space temperature sensor shall transmit temperature to the local panel of FMCS. FMCS shall modulate cooling 2-way valve and energize stages of electric heat to maintain space temperature setpoint (adjustable at GUI).
- C. Discharge air temperature sensor shall transmit temperature to the local panel of the FMCS. FMCS shall open the chilled water valve 100% and close the outside air damper when the discharge air temperature drops below 38degf. Discharge air transmitter shall be located between the heating and cooling coils.
- D. Return air humidity shall be transmitted to the local panel of the FMCS. The FMCS shall open the chilled water valve 100% when the return air humidity rises above set point (Adjustable at GUI).
- E. A high limit thermostat located in the unit return air will stop the fan on a rise in temperature above its set point. Thermostat shall be set at 125 degrees F and require a manual reset. Smoke detector shall stop the fan through the fire alarm system.

7.4 CAFETORIUM AIR UNITS:

- A. System shall be started and stopped from the FMCS when the starter H-O-A switch is in the auto position. All safety controls shall stop the unit regardless of which position the H-O-A switch is in.
- B. Space temperature sensor shall transmit temperature to the local panel of FMCS. FMCS shall modulate cooling and heating valves to maintain space temperature set point (adjustable at GUI).
- C. Discharge air temperature sensor shall transmit temperature to the local panel of the FMCS. FMCS shall open the chilled water valve 100% and close the outside air damper when the discharge air temperature drops below 38degf. Discharge air transmitter shall be located between the heating and cooling coils.
- D. Return air humidity shall be transmitted to the local panel of the FMCS. The FMCS shall open the chilled water valve 100% when the return air humidity rises above set point (Adjustable at GUI).
- E. Return Air CO2 shall be transmitted to the local panel of the FMCS. FMCS shall modulate the outside air and return dampers to maintain the minimum required outside air CFM and to keep the CO2 levels below 700ppm. (adjustable at GUI).
- F. A high limit thermostat located in the unit return air will stop the fan on a rise in temperature above its set point. Thermostat shall be set at 125 degrees F and require a manual reset. Smoke detector shall stop the fan through the fire alarm system.

7.5 CONVENT AIR UNITS:

- A. System shall be started and stopped from the FMCS when the starter H-O-A switch is in the auto position. All safety controls shall stop the unit regardless of which position the H-O-A switch is in.

- B. Space temperature sensor shall transmit temperature to the local panel of FMCS. FMCS shall modulate cooling and heating control valves to maintain space temperature set point (adjustable at GUI).
- C. Discharge air temperature sensor shall transmit temperature to the local panel of the FMCS. FMCS shall open the chilled water valve 100% and close the outside air damper when the discharge air temperature drops below 38degf. Discharge air transmitter shall be located between the heating and cooling coils.
- D. Return air humidity shall be transmitted to the local panel of the FMCS. The FMCS shall open the chilled water valve 100% when the return air humidity rises above set point (Adjustable at GUI).
- E. A high limit thermostat located in the unit return air will stop the fan on a rise in temperature above its set point. Thermostat shall be set at 125 degrees F and require a manual reset. Smoke detector shall stop the fan through the fire alarm system.

7.6 EXHAUST FANS 2 & 3:

- A. Exhaust fans shall be energized when their associated air unit is energized in the occupied mode only and off 100% of the time during the unoccupied mode regardless of the associated air units fan status

7.7 CHILLED WATER SYSTEM

- A. System shall be started and stopped from the FMCS when the starter H-O-A switch is in the auto position. All safety controls shall stop the unit regardless of which position the H-O-A switch is in.
- B. FMCS shall monitor the chilled water differential pressure transmitter (located at the AHU-3) and shall modulate the chilled water pumps to maintain the chilled water differential pressure setpoint (adjustable at GUI). Lead chilled water pump shall be rotated on a weekly basis. Lead pump shall be selected based on runtime. If the lead pump fails to start then the lag pump shall take the lead position and an alarm shall be sounded at the GUI.
- C. FMCS shall monitor the chilled water flow transmitter and shall modulate the 2-way chilled water valve located in the chilled water bypass line to maintain the minimum flow through the chiller.

I/O SUMMARY CHART

	DO	DI	AI	AO
VAV Units				
Fan start/stop	X			
Fan status		X		
Supply temperature			X	
Cooling valve				X
VFD drive				X
Return air temperature			X	

Return air Humidity			X	
Outside air CFM			X	
Return air CO2			X	
Outside air Damper				X
Return air Damper				X.
Duct Static Pressure			X	
VAV Terminal Boxes				
Space Temperature			X	
Space Temperature Setpoint			X	
Discharge Temperature			X	
CFM			X	
Electric Heat	X			
Override Button		X		
Kitchen Roof Top Unit				
Fan start/stop	X			
Fan status		X		
Supply temperature			X	
Cooling valve				X
Electric Heat Stages	X			
Space Temperature			X	
Space Temperature Setpoint			X	
Override Button		X		
Outside Air Damper	X			
Cafetorium Air Units				
Fan start/stop	X			
Fan status		X		
Supply temperature			X	
Cooling valve				X
Heating valve				X
Space Temperature			X	
Space Temperature Set point			X	
Override Button		X		
	DO	DI	AI	AO
Return air temperature			X	
Return air Humidity			X	
Return air CO2			X	
Outside air Damper				X
Return air Damper				X.
Convent Air Units				
Fan start/stop	X			
Fan status		X		
Supply temperature			X	
Cooling valve				X
Heating valve				X
Space Temperature			X	
Space Temperature Set point			X	
Override Button		X		

Return air temperature				X	
Return air Humidity				X	
Exhaust Fans 2 & 3					
Fan start/stop	X				
Fan status		X			
Chilled Water System					
Chiller stop/start	X				
Chiller status		X			
Chiller alarm		X			
Chiller set point					X
Chilled water pump start/stop	X				
Chilled water pump status		X			
Chilled water differential pressure				X	
Chilled water supply temperature				X	
Chilled water return temperature				X	
Chilled water pump VFD					X
Chilled water 2-way bypass valve					X
Misc.					
Outside air temperature				X	
Outside Air Humidity				X	

END OF SECTION 23 09 00

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and Pipe Fittings
- B. Chilled Water Piping System

1.2 RELATED WORK

- A. Section 23 00 00 - General Provisions
- B. Section 23 05 16 - Expansion Compensation
- C. Section 23 05 29 - Anchors and Supports
- D. Section 23 05 53 - Mechanical Identification
- E. Section 23 07 00 - Piping and Equipment Insulation

1.3 REFERENCES

- A. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- B. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.9.

1.5 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ANSI/ASME Sec. and applicable State Labor Regulations.

1.6 SUBMITTALS

- A. Submit shop drawing and product data under provisions of Section 01 30 00– Administrative Requirements.
- B. Include data on pipe materials, pipe fittings, valves, and accessories.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00 – Product Requirement.
- B. Store and protect products under provisions of Section 01 60 00 – Product Requirement.

PART 2 - PRODUCTS

2.1 HEATING WATER PIPING

- A. Steel Pipe: ASTM A53, Schedule 40 ERW.
- B. Piping terminal heating coils (3' max.) Type M hard drawn copper, ASTM 88, wrought copper fittings.

2.2 CHILLED WATER PIPING - (ABOVE GROUND)

- A. Steel pipe: ASTM A53, Schedule 40, ERW.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

- A. For piping materials see piping section.
- B. All A.H. unit drains shall have cleanouts.
- C. All A.H. unit auxiliary drains shall be piped separately from primary drains to floor drains.
- D. Drain piping (A.H. units) copper tubing type M, hard drawn, ASTM 88 wrought copper fittings.

2.4 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 inches and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe size over 2 inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; 1/16 inch thick preformed neoprene.

2.5 VALVES

- A. For valves in hydronic systems, see Valve Section 23 05 23.

2.6 RELIEF VALVES

- A. Bronzed body, teflon seat, stainless steel stem and springs, automatic.

PART 3 - EXECUTION

3.1 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.
- D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide clearance for installation of insulation, and access to valves and fittings.
- E. Provide access where valves and fittings are not exposed.
- F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H. Prepare pipe and fittings, supports, and accessories for finish painting. Refer to Section 099000 – Painting and Coating.

3.3 APPLICATION

- A. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- B. Install ball or butterfly valves for throttling, bypass, or manual flow control services.
- C. Provide spring loaded check valves on discharge of condenser water pumps.
- D. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- E. Use lug end butterfly valves to isolate equipment.
- F. Provide 3/4 inch gate or ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to drain if specified on drawings.

END OF SECTION 23 21 13

SECTION 23 21 14 - UNDERGROUND PRE-INSULATED PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specifications Sections, apply to this section.
- B. SUMMARY: Extent of each type of underground Preinsulated piping Systems is indicated on the drawings and by provisions of this section.

1.2 DESCRIPTION:

- A. Work Included:
 - 1. Underground chilled water piping

1.3 SUBMITTALS:

- A. General: All submittals shall comply with the requirements of Division 1 Sections and Section 23 00 00.
- B. Product Data: Data shall be submitted for the following:
 - 1. List of installations.
 - 2. System.
 - 3. Installation Instructions.
 - 4. Anchor and thrust block details.
 - 5. Layout drawing.
 - 6. Branch take-off details.
 - 7. Floor and wall seals.
 - 8. Valves.
- C. QUALITY ASSURANCE:
 - 1. American Society for Testing and materials (ASTM):
 - 2. Standard A-53, Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless.
 - 3. Standard A-234, piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and elevated temperature.
 - 4. Standard B-88, Seamless Copper Water Tube.
 - 5. Standard D-1784, Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Certain items in this Specification are listed by manufacturer and/or manufacturer=s model number to establish general style, type, character, and quality of product desired. Similar items manufactured by other than those listed will be considered, providing submittals are made according to Pre-Bid Approval requirements of Instructions to Bidders.
- B. Where no manufacturer or model number are given, any product meeting performance or design criteria, or referenced trade association standard may be used and Pre-Bid approval is not required.

2.2 UNDERGROUND PIPING SYSTEMS:

- A. General
 - 1. All underground pre-insulated piping systems shall be the product of one manufacturer.
 - 2. Manufacturers shall be:
 - a. Thermacor Process, LP
 - b. Thermal Pipe Systems, Inc. (TPS)
- B. Piping Systems
 - 1. The piping systems shall be factory fabricated, pre-insulated, and jacketed underground piping systems.
 - 2. Systems shall be:
 - a. Process, L.P.
 - b. Pipe Systems, Inc. (TPS)
- C. Carrier Pipe
 - 1. Chilled Water and Heating Hot Water Piping shall be a schedule 40 black steel, ASTM A-53, Grade B. Joints shall be butt-welding type, except on pipe sizes 2 inches and smaller, joints may be socket welded. Fitting shall be standard weight butt welding type ASTM A-234, with long radius.
- D. Insulation
 - 1. Insulation shall be:

a. Type:	Urethane Foam
b. K Factor:	0.13 BTU/(HR) (SQ. FT.) (F/IN)
c. Density:	2.0 lb/CUBIC FOOT
d. Closed Cell Content:	90 % (minimum)- no open cell foam permitted of 10% or more.
 - 2. Minimum Thickness:

a. Pipe Size, In.	1@-3@	4@-6@	8@-12@	14@-18@
b. Thickness	1@	1-1/2@	2@	3@
- E. The insulation shall be foamed between the pipe and jacket and shall be bonded to the carrier pipe and casing surfaces.
- F. Outer Casing
 - 1. The outer casing pipe shall be high density polyethylene. The minimum wall thickness shall

be 150 mils. The jacket closures shall be a cylindrical form with a single longitudinal split and shall be the same thickness as the casing. Pressure testable joint closures to be fusion welded. Must maintain 5 lb test.

G. Fittings

1. Fittings shall be factory prefabricated and pre-insulated. Fitting covers shall be molded one (2) piece. No miters, tape, or zeston 2 type covers are permitted. Fitting covers to be minimum of 150 mils thick.

PART 3 – EXECUTION

3.1 EXCAVATION, TRENCHING AND BACKFILLING:

- A. Refer Architectural Section Excavating, Filling, Grading.

3.2 INSTALLATION

- A. All materials shall be unloaded, stored and installed in accordance with the manufacturers recommendations to conform with the contract documents.
- B. Where pre-insulated piping passes through metal sleeves in walls and floors, the insulations and jacketed system shall extend continuously through such sleeves.
- C. Open end pipe shall be capped during installation to keep dirt and other foreign material out of system.
- D. Expansion loops and bends shall be provided in accordance with the manufacturer's standard.
- E. Welded joints shall be fusion welded. Changes in direction of piping shall be made with welded fittings. Mitering or notching to form elbows and tees shall not be permitted.
- F. Joints between pipe sections and joints between conduit pipe and fittings shall be made in accordance with the manufacturer's written instructions. Joints shall include closure sleeve, insulation, and coatings or wrapping as applicable. Joint materials shall be the product of the system manufacturer and shall be the same product as specified for the system.
- G. The vapor barrier jacket shall have the vapor barrier extended continuously across all joints.
- H. Anchors and thrust blocks shall be installed in accordance with manufacturer's recommendations.

3.3 TESTING

- A. Prior to closure of field joints, the carrier pipe shall be hydrostatically tested at 1-1/2 times the system operating pressure or 150 psig, whichever is greater, for a period of not less than 2 hours. No loss in pressure will be permitted. Any defective sections shall be replaced and any defected

welds repaired. system shall be retested until systems are tight.

- B. Materials, equipment, and labor required to test the system shall be the responsibility of the contractor.

3.4 CERTIFICATION:

- A. During the testing period, a factory representative of the system manufacturer shall be present to witness each test. If systems are tested in stages, the factory representative's presence shall be required at each stage.
- B. Prior to backfilling, a factory representative shall review the installation for deficiencies. Any deficiencies found shall be corrected by the contractor. No backfilling shall occur until written certification of acceptance installation is provided by the manufacturer to the engineer.

END OF SECTION 23 21 14

SECTION 23 21 16 - HYDRONIC SPECIALITIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Air vents.
- B. Flow indicators, controls, meters.

1.2 RELATED WORK

- A. Section 23 21 13 - Hydronic Piping

1.3 REFERENCES

- A. ANSI/ASME - Boilers and Pressure Vessels Code.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME Boilers and Pressure Vessels code Section 8D for manufacturer of tanks.

1.5 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.6 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00 – Administrative Requirements.
- B. Submit shop drawings and product data for manufactured products and assemblies required for this project.
- C. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 70 00 – Execution

Requirements.

- B. Include installation instruction, assembly views, lubrication instructions, and replacement parts lists.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Certain items in this Specification are listed by manufacturer and/or manufacturer's model number to establish general style, type, character, and quality of product desired. Similar items manufactured by other than those listed will be considered, providing submittals are made according to Pre-Bid Approval requirements of Instructions to Bidders, page IB-3, Paragraph 4.3.
- B. Where no manufacturer or model number are given, any product meeting performance or design criteria, or referenced trade association standard may be used but Pre -Bid Approval is required.

2.2 AIR VENTS

- A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8" brass needle valve at top of chamber.
- B. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; suitable for system operating temperature and pressure, with isolating valve.
- C. Washer Type: Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.3 STRAINERS

- A. Size 2" inch and under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 2-1/2" to 4" flanged iron body for 175 psig working pressure, Y pattern with 1/8" stainless steel perforated screen.
- C. Size 5 inch and larger: Flanged iron body for 175 psig working pressure, Y pattern with 1/8" stainless steel perforated screen.

2.4 FLOW METERS

- A. Heavy duty, 316 stainless steel pitot tube type flow measuring sensor with instrument connections with valves 1/4" SAE flare by 1/8" female NPT brass valves on 1/8" male NPT fittings.
- B. Portable meter consisting of case containing one, 3 percent accuracy pressure gauge with 0-60 feet pressure range; two, 3 percent accuracy pressure gauges with 0-135 inches and 0-60 feet pressure ranges for 500 psig maximum working pressure, color coded hoses for low and high pressure connections, and connectors suitable for connection to read-out valves.

2.5 ACCEPTABLE MANUFACTURERS

- A. Annubar with Eagle Eye flow meter.
- B. PRESCO Annular with model GM meter.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- E. Provide valved drain and hose connection on strainer blow down connection.

END OF SECTION 23 21 16

SECTION 23 21 23 - PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes all pumps except where integral with manufactured piece of equipment.

1.2 RELATED WORK

- A. Section 23 21 13 - Hydronic Piping
- B. Section 23 05 23 - Valves
- C. Section 23 05 29 - Supports and Anchors
- D. Section 23 07 00 - Piping and Equipment Insulation
- E. Section 22 10 00 - Plumbing Piping

1.3 REFERENCES

1.4 SUBMITTALS

- A. Submit shop drawings under provisions of Sections 01 30 00 – Administrative Requirements & 23 00 00 – General Mechanical.
- B. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S FRAME MOUNTED END SUCTION PUMPS

- A. Aurora 340 Series
- B. Bell & Gossett Model 1510
- C. Taco KV/KS Series
- D. Paco LF Series

- E. Armstrong 4030 Series
- F. Patterson VIL Series
- G. Pump supplier shall be an authorized factory distributor for equipment supplied.

2.2 GENERAL

- A. Statically and dynamically balance rotating parts.
- B. Construction to permit complete servicing without breaking piping or motor connections.
- C. Pumps to operate at 1750 rpm unless specified otherwise.
- D. Pump connections to be flanged.

2.3 BASE MOUNTED PUMPS

- A. Type: Centrifugal, single stage, direct connected.
- B. Casing: Cast iron, split volute, single or double suction, renewable bronze wearing rings, flanged suction and discharge.
- C. Impeller: Bronze, fully enclosed, keyed to shaft.
- D. Shaft: High grade alloy steel with copper, bronze or stainless steel shaft sleeves.
- E. Bearing: Oil lubricated roller or ball bearings with oil reservoirs. Provide oil seal and integral dirt and water seal at each end of reservoir.
- F. Drive: Flexible coupling with coupling guard.
- G. Seals: Pumps shall have mechanical seals and hardened 316 stainless steel short sleeve.
- H. Baseplate: High grade heat treated cast iron or reinforced heavy steel with integral drain rim grout base.
- I. Non overloading.
- J. Bearing shall be grease proof bearing cartridges. Shaft deflection shall not exceed .002 at stuffing box.
- K. Bearings shall be designed for average life of ten years and bearing arms are to be cast integral with lower half of casing to assure proper bearing alignment.
- L. Pumps shall be horizontal split case with casing suitable for 250 psi case wearing pressure. (Chilled water, heating water pumps - end suction type).

- M. Impellers shall not exceed 90% of maximum published diameter.
- N. Furnish two (2) spare seals for each pump.
- O. Pump impeller diameter shall be selected such that break hp will not exceed specified hp at any operating point which exists on that particular impeller diameter pump curve.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide drains for bases and stuffing boxes piped to and discharging into floor drains.
- B. Provide air cock and drain connection and horizontal pump casings.
- C. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sized 4 inches and over.
- D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are maximum efficiency curve.
- E. Qualified millwright to check, align, and certify base mounted pumps prior to start-up.

3.2 PUMP SCHEDULE: See Plans.

END OF SECTION 23 21 23

SECTION 23 25 00 - CHEMICAL (WATER) TREATMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Cleaning of piping systems.
- B. Chemical feeder equipment.
- C. Treatment for closed systems.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 23 21 13 - Hydronic Piping: Water coupon rack, by-pass (pot) feeder.

1.3 RELATED SECTIONS

- A. Section 23 21 13 - Hydronic Piping
- B. Section 23 21 16 - Hydronic Specialties

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00 – Administrative Requirements.
- B. Submit shop drawings indicating system schematics, equipment locations, and controls schematics.
- C. Submit product data indicating chemical treatment materials, chemicals, and equipment.
- D. Submit manufacturer's installation instructions under provision of Section 01 30 00 – Administrative Requirements.
- E. Submit reports indicating start-up of treatment systems are completed and operating properly.
- F. Submit reports indicating analysis of system water after cleaning and after treatment.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 70 00 – Execution Requirements.

- B. Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs.
- C. Include step by step instructions on test procedures including target concentration.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section. Company shall have local representatives with water analysis laboratories and full time service personnel.

1.7 REGULATORY REQUIREMENTS

- A. Conform applicable EPA code for addition of non-potable chemical to building mechanical systems, and for delivery to public sewage systems.

1.8 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems for one (1) year from date of Substantial Completion.
- B. Provide monthly technical service visits to perform field inspection and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two (2) copies of field service report after each visit.
- C. Provide laboratory and technical assistance service for warranty period.
- D. Include two hour training course for operating personnel, instructing them on installation, care, maintenance, testing, and operation of water treatment systems. Arrange course at start-up of systems.
- E. Provide on site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

1.9 MAINTENANCE MATERIALS

- A. Submit maintenance materials under provisions of Section 01 70 00.
- B. Provide sufficient chemicals for treatment and testing during warranty period.

1.10 APPROVAL OF PRODUCT PRIOR TO BIDDING

- A. Refer to Section 01 60 00, Material and Equipment, paragraph, 1.4, 1.4A and 1.4B for product

prior approval requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Certain items in this Specification are listed by manufacturer and/or manufacturer's model number to establish general style, type, character, and quality of product desired. Similar items manufactured by other than those listed will be considered, providing submittals are made according to Pre-Bid Approval requirements of Instructions to Bidders.
- B. Where no manufacturer or model number are given, any product meeting performance or design criteria, or referenced trade association standard may be used and Pre-Bid approval is not required.

2.2 MATERIALS

- A. System Cleaner:
 - 1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
 - 2. Algicide.
- B. Closed System Treatment (Water):
 - 1. Sequestering agent to reduce deposits and adjust ph (polyphosphate).
 - 2. Corrosion inhibitors: (liquid) boron-nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
 - 3. Conductivity enhancers: phosphates or phosphonates.

2.3 EQUIPMENT

- A. By-pass pot feeder: Quick opening for working pressure of 175.
- B. Drip Feeder: Plastic reservoir with coil of capillary tubing with probe, weight, charging syringe, and clip.
- C. Solution Metering Pump: Positive displacement, diaphragm pump with adjustable flow rate, thermoplastic construction, continuous-duty fully enclosed electric motor and drive, and built in relief valve.
- D. Solution Tanks: 50 gallon capacity, polyethylene, self-supporting, 5 gallon 3.8 graduated markings; molded fiberglass cover with recess for mounting pump, agitator, and liquid level switch.
- E. Agitator: Totally enclosed, explosion proof electric motor, stainless steel clamp and motor mount, 5/8 inch diameter Type 316 stainless steel propeller.

- F. Liquid Level Switch: Polypropylene housing with integrally mounted PVC air trap, receptacles for connection to metering pump, and low level alarm.
- G. Conductivity Controller: Packaged monitor controller with solid state circuiting, five percent accuracy, linear dial adjustment, built-in calibration switch, on-off switch and circuit and recorder.
- H. Water Meter: Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.
- I. Solenoid Valves: Forged brass body globe pattern, normally open or closed as required, general purpose solenoid enclosure, and continuous duty coil.
- J. Timers: Electronic timers, infinitely adjustable over full range, 150 second and five minute range, mounted together in cabinet with hands-off-automatic switches and status lights.

2.4 TEST EQUIPMENT

- A. Provide white enamel test cabinet with local and fluorescent light, capable of accommodating 4-10 zeroing titrating burettes and associated reagents.
- B. Provide the following test kits:
 - 1. Alkalinity titration test kit.
 - 2. Chloride titration test kit.
 - 3. Sulphite hardness titration test kit.
 - 4. Total hardness titration test kit.
 - 5. Low phosphate test kit.
 - 6. Conductivity bridge, range 0-10,000 microhms.
 - 7. Creosol red ph slide complete with reagent.
 - 8. Portable electronic conductivity meter.
 - 9. High nitrite test kit.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.
- B. Place terminal control valves in open position during cleaning.

3.2 CLEANING SEQUENCE

- A. Add cleaner to closed systems at concentration as recommended by manufacturer.
- B. Hot Water Heating Systems: Apply heat while circulation slowly raising temperature to 160 degree

F and maintain for 12 hours minimum. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water and repeat until system cleaner is removed.

- C. Chilled Water Systems: Circulate for forty eight hours, then drain systems as quickly as possible. Refill with clean water, circulate for 24 hours, then drain. Refill with water and repeat until system cleaner is removed.
- D. Use neutralizer agents on recommendation of system cleaner supplier and approval of Architect.
- E. Flush open systems with clean water for one hour minimum. Drain completely and refill.
- F. Remove, clean, and replace strainer screens.
- G. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.4 CLOSED SYSTEM TREATMENT

- A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around globe valve downstream of circulating pumps unless indicated otherwise.
- B. Introduce closed system treatment through bypass feeder when required or indicated by test.
- C. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.5 CONDENSER WATER SYSTEMS (COOLING TOWERS)

- A. Provide automatic condenser water control systems for inhibitor feed, blowdown and biocide feeds. Inhibitor application shall be meter activated, blowdown shall be conductivity activated, and biocide shall be meter fed with blowdown locked out to insure biocide retention time.
- B. Control system shall incorporate solid state integrated circuits and digital LED displays, in NEMA-12 steel enclosure. Provide gasketed and lockable door.
- C. Base dissolved solids control on conductivity and include:
 - 1. LED digital readout display (microhm/cm).
 - 2. Temperature compensated sensor probe adaptable to sample stream manifold.
 - 3. High, low, normal conductance indicator lights (LED).
 - 4. High or low conductance alarm light (flash or steady switch shall have silence position).
 - 5. Illuminated legend shall indicate "ALARM" whenever alarm condition exists.
 - 6. Hand-off-automatic switch for solenoid bleed valves.

7. Illuminated legend shall indicate "BLEED" when valve is operated.
 8. Adjustable hysteresis or dead-band (internal).
- D. Base inhibitor feed control on make-up volume and include:
1. Solid state counter (1-125 field selectable).
 2. Solid state timer (adjustable 1/4 to 5 minutes).
 3. Test switch.
 4. Hand-off-automatic switch for chemical pump.
 5. Illuminated legend shall indicate "FEED" when pump is activated.
 6. Solid state lock-out timer (adjustable 1/4 to 3 hours) and indicator light. Lock-out timer shall deactivate the pump and activate alarm circuits.
 7. Panel totalizer (amount of makeup), electro-mechanical type.
- E. Biocide programmer to include:
1. 24 hour timer with 14 day skip feature to permit activation any hour of the day.
 2. Precision solid state bleed lock-out timer (0-9 hours) and biocide pump timer (0 - 2 - 1/4 hours), clock controlled.
 3. Solid state alternator to enable the use of two different formulations.
 4. Digital display of the time of day (24 hours).
 5. LED display of day of week (14 days).
 6. Fast and slow clock set controls (internal).
 7. Battery back-up so clock is not disturbed by power outages, quartz timekeeping accuracy.
 8. Hand-off-automatic switches for biocide pumps.
 9. Illuminated legend shall indicate "BIOCIDE A" or "BIOCIDE B" when pump is activated.
- F. Provide water meter on system make-up, wired to control system.
- G. Provide solution pumps to feed sequestering agent and corrosion inhibitor from solution tank into condenser water supply to tower. Provide agitator as required.
- H. Provide conductivity controller to sample condenser water and operate 11 inch solenoid bleed valve and piping to blow down controller sampler wired to open when condensing water pump is operating.
- I. Introduce algicide to tower by intermittent slug feed.
- J. Provide liquid level switch in each solution tank to deactivate solution pump and agitator, and sound local alarm bell.
- K. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

END OF SECTION 23 25 00

SECTION 23 31 00 - DUCTWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Low pressure duct.
- B. Medium and high pressure duct.
- C. Fire and Smoke Dampers

1.2 RELATED WORK

- A. Section 23 05 23 - Supports and Anchors
- B. Section 23 07 00 - Piping and Equipment Insulation
- C. Section 23 36 00 - Air Terminal Units
- D. Section 23 37 00 - Air Inlets and Outlets
- E. Section 23 05 93 - Testing and Balance

1.3 REFERENCES

- A. ASHRAE, 2009 Fundamentals, Chapter 21.
- B. ASHRAE, 2008 Equipment, Chapter 18.
- C. NFPA 90A, 90B.
- D. H.V.A.C. Duct Construction Standards - SMACNA 1995.

1.4 DEFINITIONS

- A. Duct sizes: Inside clear dimensions for wrapped ducts, maintain sizes inside lining. Metal to metal sizes for internally lined ductwork.
- B. Low Pressure: Three pressure classifications: 1/2" WG positive or negative static pressure and velocities less than 2,000 fpm, 1" WG positive or negative static pressure and velocities less than 2,500 fpm and 2" WG positive or
- C. Medium Pressure: Three pressure classifications: 3 inch WG positive or negative static pressure

and velocities less than 4,000 fpm, 4" WG positive static pressure and velocities greater than 2,000 fpm. 6" WG positive static pressure and velocities greater than 2,000 fpm.

1.5 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and NFPA 90B Standards.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Construct ductwork to International Mechanical Code Standards

PART 2 - PRODUCTS

2.1 MEDIUM PRESSURE DUCTWORK

- A. All ductwork on high velocity systems shall be flat oval and/or round type constructed as per latest edition of ASHRAE Guide and as shown on the plans, and shall be absolutely air tight. Round ductwork as shown and required shall be furnished.
- B. Metal gauges for single wall round and flat oval duct shall be as follows:

=====			
1.	ROUND DUCTS		
	Duct diameter	Spiral Pipe Longitudinal	Fittings and seam pipe
	3" thru 14"	26	24
	15" thru 26"	24	22
	27" thru 36"	22	20
	37" thru 50"	20	20
=====			
2.	FLAT OVAL DUCTS		
	Major Dimension	Spiral Pipe Longitudinal	Fittings and seam pipe
	Up to 24"	24	20
	25" thru 36"	22	20
	37" thru 48"	22	18
	49" thru 60"	20	18
	61" thru 70"	20	16
=====			

- C. Longitudinal joints shall be grooved seam type; and joints shall be male and female slip type, with maximum tolerance of 1/64" between outside diameter of male and inside diameter of female end.
- D. Interior of all ductwork shall be smooth and each length shall be carefully inspected after construction and any defects removed.
- E. Forty-five (45) degree elbows shall be of the three-piece construction. Ninety degree (90) elbows

shall be five-piece construction. Center line radius of elbows shall not be less than 1-1/2 times the pipe diameter.

- F. As shown on plans, take-off to mixing boxes are 45 degree take-off.
- G. Ample length of duct, branch connection, tees, 45 degree and 90 degree elbows shall be submitted for approval of design and workmanship before any construction is commenced.
- H. Mastic shall be applied to male duct end, joints pushed together surplus mastic removed and the joint finished with hard cast "iron grip".
- I. All connections between ductwork and attenuating chambers shall be made with pre-insulated flexible air duct, minimum 24" in length.
- J. Flexible duct shall be clamped to round pipe of branch connections and attenuator chamber stub with clamps, with mastic or tape applied to the male ends of the stubs before insertion into the flexible duct. Mastic and tape must comply with UL181A & UL181B.
- K. All ductwork shall be thoroughly supported and braced according to latest edition of ASHRAE Guide & SMACNA Manual.
- L. On completion of medium pressure duct and before connection of mixing boxes to system, all open ends shall be tightly closed and air pumped into duct system until an air pressure of one and a half times external static pressure specified for the air handling unit serving this ductwork is obtained.
- M. This pressure shall be maintained until all joints are inspected and examined for leaks.
- N. All leaks shall be repaired immediately.
- O. The above work shall be completed before any furring or ceiling work is started by General Contractor.
- P. Flexible connections shall be provided in high pressure supply ductwork between the duct and equipment.
- Q. All supply flat oval ductwork thru first 20 feet of A.H. units shall be double wall insulated with perforated liner sound attenuating duct and fittings. (VAV Units only)
- R. All medium and high pressure duct shall be spiral ductwork with anti-microbial coating from factory.
 - 1. All spiral ductwork surfaces shall have a factory applied antimicrobial coating, which complies with all items in this section.
 - 2. The active agent of the antimicrobial coating must be registered with the Environmental Protection Agency (EPA) specifically for internal use in HVAC systems. Submittals must include a copy of the EPA certification with MSDS reports.
 - 3. Applied coating must be tested at an independent laboratory for efficacy and show effectiveness against fungi and bacteria.
 - 4. Products should be independently tested to show compliance with applicable fire codes, ASTM and UL codes.

- a. Antimicrobial coating for duct systems must meet or exceed the following ratings as tested to UL-723.
 - 1) Smoke Developed = 0
 - 2) Flame spread = 0
 - 5. Coating shall be non-toxic and shall not release active ingredient into the air stream.
 - 6. Antimicrobial coating shall be uniformly, factory applied to ensure complete (100%) coverage on the specified surface. No bare un-coated surfaces will be accepted.
 - 7. All excess metal and non-metal materials with antimicrobial coating must be capable of disposal without requiring and hazardous waste permit.
 - 8. Blemishes over ¼" wide shall be recoated at job site provided field touch-up coating maintains full antimicrobial performance.
 - 9. Acceptable antimicrobial coating products are; AVRON46.
 - 10. Insulating materials used in the HVAC system will be independently tested to resist the growth of mold and bacteria.
 - 11. Products stored on the job site should be properly protected to reduce the likelihood of contamination prior to installation.
 - 12. Joining compounds such as caulks and mastics shall be UL listed per UL-181.
- S. All ductwork delivered to the job site shall have the ends covered with visqueen and taped to maintain the cleanliness of the interior of the ductwork.

2.2 INSULATED MEDIUM AND HIGH PRESSURE FLEXIBLE DUCT

- A. Provide where indicated on drawings Flexmaster Type 4M UL181 Class I Air Duct. Approved equal: Thermaflex model MK-C or prior approved equal with sample submitted during prior approval stage.
- B. The duct shall be constructed of a heavy coated fiberglass cloth fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.
- C. The internal working pressure rating shall be at least 12" w.g. positive and 5" w.g. negative with a bursting pressure of at least 2½ time the working pressure.
- D. The duct shall be rated for a velocity of at least 5500 feet per minute.
- E. The duct must be suitable for continuous operation at a temperature range of -20° F to +250°
- F. Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 5 minimum (R-4.2 is not acceptable) at a mean temperature of 75° F.
- G. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.
- H. Maximum length to be 2'-0".

2.3 LOW PRESSURE DUCTWORK

- A. Furnish and install all ducts for the air conditioning, heating and ventilating systems. Ductwork shall be complete with grilles, vanes splitters, flashings, hangers, flexible connections, manual dampers, fresh air inlet louvers, reinforcing angles, transitions to equipment, etc.
- B. All low pressure ductwork (mean velocity less than 2,000 FPM and static pressure in duct 2" of water or less) shall be constructed as per SMACNA Standards, 1995 Edition, Chapter 1, and shall be of the gauge metal and reinforced as per SMACNA Standards, 1995 Edition.
- C. Flashing shall be of the same material as specified under the roofing and flashing section of these specifications, or of 16-ounce sheet copper and shall be furnished and installed around all outside openings used for ducts or fans where required. Roof flashing shall extend at least 8" above roof. Cooperate with roofing contractor when installing flashing.
- D. All duct connections to equipment shall be made with fire and mildew resistant flexible connections of canvas or other acceptable materials. Connections shall have suitable metal collar frames at each end and shall not be less than 4" long with at least 1" of slack in the connection. Flexible connections shall be heat resistant to 500 degrees F continuously.
- E. Duct dimensions shown are metal sizes. All edges shall be straight and true.
- F. All flexible connections, duct liner and adhesives shall be U.L. listed as having a maximum flame spread of 50, fuel contribution of 25 and smoke contribution of 25.
- G. This Contractor shall furnish and install in ductwork all dampers, vanes splitters, etc.. as shown on the drawings or necessary to make the system complete. Where dampers or splitters can not be accessed through lay in ceiling, Contractor shall provide lockable 24" x 24" access door. Contractor shall coordinate location with Architect.
- H. Shafts shall be marked to show position of dampers, vanes, splitters, etc.
- I. Ductwork shall be supported in accordance with SMACNA Plate No. 17 and No. 18, up to and including band iron hangers attached to duct by means of screws or rivets per hanger.
- J. Access doors shall be provided in ductwork for all automatic dampers and each manual damper 3 square feet in area or larger, and shall be so located that damper can be completely serviced through the access door. Access door shall be provided with felt gaskets and suitable hinges and locks. Where access doors occur in insulated duct, double skin insulated doors shall be used.
- K. Where square ducts are shown, provide single vane elbows as per Plate 22, Figure A, SMACNA Standards, 1995 Edition. For all ductwork over 18" provide double vane square elbow as shown in Figure C of the Plate.
- L. All low pressure ductwork joints shall be sealed with hard cast "iron grip".
- M. Flexible air duct for connections between low pressure rectangular duct and ceiling diffusers shall be pre- insulated and listed by Underwriters Laboratories under U.L Standard 181 as a Class 1 flexible air duct and complying with NFPA Standards 90A and 90B.

- N. All flex duct 45 degree and 90 degree turns shall be metal hard duct.

2.4 INSULATED ACOUSTICAL LOW PRESSURE FLEXIBLE DUCT

- A. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel.
- B. Provide where indicated on drawings Flexmaster Type 8M UL181 Class I Air Duct.
- C. Fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.
- D. The internal working pressure rating shall be at least 6" w.g. positive and 4" w.g. negative with a bursting pressure of at least 2½ time the working pressure.
- E. The duct shall be rated for a velocity of at least 4000 feet per minute.
- F. The duct must be suitable for continuous operation at a temperature range of -20° F to +250°
- G. Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council's Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM 477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	7	31	40	38	40	27
8" diameter	13	29	36	35	38	22
12" diameter	21	28	29	33	26	12

The radiated noise reduction (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	5	8	7	8	11	15
8" diameter	10	7	7	8	10	13
12" diameter	9	6	6	5	9	13

The self generated sound power levels (LW) dB re 10^{-12} Watt of a 10 foot length of straight duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	42	31	23	18	17	21
8" diameter	41	34	27	19	18	21
12" diameter	54	45	38	31	27	23

Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 5.0 at a mean temperature of 75° F. (R-4.2 is not acceptable)

- H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.
- I. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.
- J. Maximum length to be 3'-0
ALL FLEX CONNECTIONS TO CEILING DIFFUSERS MUST BE FACTORY DESIGNED TO HAVE NO DIMENSIONAL CONTORTION WHEN CONNECTED TO THE DIFFUSER.

2.5 FIRE AND SMOKE DAMPERS

- A. Round and oval fire dampers shall be designed for high pressure duct systems.
- B. Rectangular fire dampers shall be designed for low pressure duct systems.
- C. All fire dampers must be NFPA 90A and UL approved.
- D. Furnish and install access doors in ductwork, walls, and ceilings where required to service all fire dampers, smoke dampers and detectors. All fire and smoke dampers shall be installed by the sheet metal contractor. All smoke detectors shall be furnished by the electrical Sub-contractor. Control of smoke dampers shall be coordinated with fire alarm system and building automation system.
- E. Rectangular Smoke Dampers - Louvers Dampers Inc. Model SD-400-UD or Ruskin FSD-35 tight seal parallel blade smoke dampers with low leakage and felted blades.
- F. Round and Oval Smoke Dampers - Shall be same as above but complete with welded round or oval

collars. Units shall be capable of handling pressures up to 6" W.G.

- G. Smoke dampers shall be Class I rated as per UL 555.
- H. Sheet metal contractor shall provide and install all smoke dampers and actuators. Dampers shall be provided with end switches
- I. Approved Manufacturers: Pottorff, Ruskin, Price, Nailor Industries, Greenheck, or prior approved equal.

2.6 SPIN TAPS

- A. All round low pressure connections to rectangular ducts shall be made with a factory fabricated spin collar fitting with damper and constructed of minimum 26 ga galvanized steel. The damper shall have a 2" raised handle with a high quality locking quadrant. A 3/8" continuous rod with "U" bolts connects the damper to the rod. Nylon end bearings are required where the rod penetrates the spin collar barrel.
- B. Provide Flexmaster #FLD-B03, Dace #26 ga MSDS – CO3 , or prior approved equal.

2.7 LOW LOSS TAP

- A. All round low pressure connections to rectangular ducts shall be made with a factory fabricated 45 degree low loss entry "shoe" tap with damper constructed of minimum 26 gage galvanized steel. The damper shall have a 2" raised handle with a high quality locking quadrant. A 3/8" continuous rod with "U" bolts connects the damper to the rod. Nylon end bearings are required where the rod penetrates the spin collar barrel.
- B. Provide Flexmaster #STOD-BO3, Dace # 26 ga STOD-C03, or prior approved equal.
- C. For medium pressure systems where used upstream of VAV terminals, the damper can be eliminated (use Flexmaster #STO or Dace 24 ga STO). Gauge shall be 24 gauge on medium pressure systems.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See details of ductwork symbols and connections on drawing.

END OF SECTION 23 31 00

SECTION 23 34 23 - POWER VENTILATORS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. In-line Exhaust Fans

1.2 RELATED WORK

- A. Section 23 05 13 - Motors
- B. Section 23 31 00 - Ductwork

1.3 REFERENCES

- A. AMCA 99 - Standards Handbook
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes
- C. AMCA 300 - Method of Publishing Sound Ratings for Air Moving Devices
- D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices
- E. SMACNA - Low Pressure Duct Construction Standard

1.4 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Sound Rating Seal.
- B. Sound Rating: AMCA 301, tested to AMCA 210 and bear the AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 33 00 – Submittal Procedures.
- B. Provide product data on wall and roof exhausters, and ceiling and cabinet fans.

- C. Provide fan curves with specified operating point clearly plotted.
- D. Submit sound power levels for both fan inlet and outlet at rated capacity.
- E. Submit manufacturer's installation instructions under provisions of Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Certain items in this Specification are listed by manufacturer and/or manufacturer's model number to establish general style, type, character, and quality of product desired. Similar items manufactured by other than those listed will be considered, provided submittals are made according to Pre-Bid Approval requirements of Instructions to Bidders, Page IB-3, Paragraph 4.3.
- B. Where no manufacturer or model number are given, any product meeting performance or design criteria, or referenced trade association standard may be used and Pre-Bid Approval is not required.

2.2 ACCEPTABLE MANUFACTURERS

- A. Greenheck, Model BSQ
- B. Cook, Model SQN
- C. Substitutions: Under provisions of Section 01 33 00.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 SCHEDULE – see plans

END OF SECTION 23 34 23

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Variable volume terminal units.
- B. Variable volume regulators.
- C. Integral heating coils.
- D. Integral damper motor operators.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section - Controls system - Building Automatic Temperature Controls

1.3 RELATED SECTIONS

- A. Section 23 31 00 - Ductwork

1.4 REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. UL 181 - Factory-Made Air Ducts and Connectors.
- C. ARI 880 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals
- D. UL - Shutoff terminal must be UL listed as a Room Air Terminal.
- E. ASTM A653/A653M, A924/A924M Steel Sheet, Zinc Coated Galvanized.
- F. NFPA 90A, Lining

1.5 SUBMITTALS

- A. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication.

- B. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and radiated sound power levels (2nd through 7th octave bands) at design maximum operating conditions. Also submit Radiated Sound NC values shall be calculated at design conditions with the following path attenuation credits:

Correction to Octave Band Sound Power Value

	2	3	4	5	6	7
ENV. ADJ.	-3	-2	-1	-1	-1	-1
Mineral Fiber Ceiling Tile	-9	-10	-12	-14	-15	-15
Space Effect Factor	-10	-11	-12	-13	-13	-14

This transfer function represents modeling assumptions based on ARI 885-90.

- C. Submit manufacturer's installation instructions.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include manufacturer's descriptive literature, operating instructions, maintenance, and repair data.
- C. Include directions for resetting all pneumatic controls.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section.

1.8 SYSTEM RESPONSIBILITY

- A. The contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the one used as "basis of design".

1.9 WARRANTY

- A. Provide one year manufacturer's parts warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. General
 - 1. Manufacturers must participate in the ARI Certification program. Unit performance data must be Rated in Accordance with ARI Standard 880, and must display the ARI Symbol on all standard units.
 - 2. Shutoff terminals must be UL listed as a Room Air Terminal.
- B. Specified Manufacturers
 - 1. TRANE
 - 2. TITUS
 - 3. Enviro-TEC
 - 4. Nailor Industries
 - 5. Krueger
 - 6. Price

2.2 MANUFACTURED UNITS

- A. Air volume supply air control terminals for connection to single medium pressure duct.
- B. Identify each terminal unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory set air flow, minimum factory set air flow, and coil type.
- C. VAV box manufacturer shall provide enclosure, transformer and factory mounting and wiring of VAV box controls provided by temperature controls contractor.

2.3 FABRICATION

- A. Casings. Units shall be completely factory assembled, manufactured of corrosion protected welded screwed steel, and fabricated with a minimum of 18-gauge metal on the high pressure (inlet) side of the VAV damper and 22-gauge metal on the low pressure (outlet) side and unit casing.
- B. INSULATION - Matt - Interior surface of unit casing acoustically and thermally lined with a minimum of 1-1/2 inch, R-Value 2.1 1.9 lb./cu. ft. density glass fiber with high density facing. Insulation shall be UL listed and meet NFPA-90A and UL 181 requirements. The cut edges on the discharge of the unit shall be covered by a metal flange.
- C. Assembly: Air volume damper, and controls shall be in a single cabinet.

2.4 VOLUME DAMPER

- A. Locate air volume damper assembly inside unit casing. Construct from extruded aluminum or a minimum of 20 gauge (0.9 mm) galvanized steel components. Key damper blades into shaft with nylon fitted pivot points. Flow sensor must be provided regardless of control chosen. Flow sensor must be a ring or cross. Bar or single point sensing device is not acceptable.
- B. Air volume control damper shall be factory calibrated assembly consisting of air valve with integral

actuator.

- C. DDC normally open actuator shall position damper.
- D. VAV boxes to be supplied with SCR heating elements

2.5 SEQUENCE OF OPERATION, AIR TERMINAL UNITS

2.6 TESTS

- A. Factory set and check all controllers to within 5% of scheduled maximum and minimum settings. Base performance on tests conducted in accordance with ARI 880.
- B. Maximum Casing Leakage: 1 percent of nominal air flow at 0.5 in wg inlet static pressure.
- C. Maximum Damper Leakage: 1 percent of design air flow at 4 in wg inlet static pressure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design air flow to 25 percent nominal air flow. Set units with heating coils for minimum 30 percent full flow.

END OF SECTION 23 36 00

SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Diffuser boots.
- B. Registers/grilles.
- C. Louvers.

1.2 RELATED WORK

- A. See Mechanical Plans for wall louvers.

1.3 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. AMCA 500 - Test Method for Louvers, Dampers, and Shutters.
- C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- D. ARI 650 - Air Outlets and Inlets.
- E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- F. SMACNA - Low Pressure Duct Construction Standard.

1.4 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.5 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

1.6 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00– Administrative Requirements.
- B. Provide product data for items required for this project.
- C. Submit schedule of outlets and inlets indicating type, size, application, and noise level.
- D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.
- E. Submit diffuser, grille and register color data to Architect for approval.

PART 2 - PRODUCTS

2.1 GENERAL

- A. See mechanical schedules and drawings for diffuser types, sizes and configuration. See architectural plans - room finish schedules for type of ceiling and wall construction.
- B. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.

2.2 ACCEPTABLE MANUFACTURERS - Ceiling Diffusers

- A. Titus TMSA Series, Krueger Series 1400 Adjustable
- B. All diffusers shall have opposed blade volume dampers and adjustable horizontal to vertical four way throw operable from face of grille. All diffusers must be aluminum.

2.3 ACCEPTABLE MANUFACTURERS - Ceiling Exhaust Grilles

- A. Titus - Model 50F Code C 1/2" x 1/2" x 1" Cube Core, Krueger EGC-10, Nailor Industries Model 51EC
- B. All exhaust registers shall have opposed blade dampers.
- C. Grilles shall have baked enamel white finish.
- D. All dampers shall be operable from grille face.

2.4 ACCEPTABLE MANUFACTURERS - Ceiling Return Air Grilles

- A. Titus - 50F Code C, Krueger EGC-10, Nailor Industries

- B. All return air shall have opposed blade dampers. See plans for filter backed grille requirements.

2.5 ACCEPTABLE MANUFACTURERS - Wall Supply Registers.

- A. Titus 1700 Series, Krueger ULTRA-FLO
- B. All registers shall have adjustable blade dampers on all registers.
- C. Furnish and install opposed blade damper on all registers.
- D. Finish to be approved by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install items in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Refer to Section 09 90 00.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and register, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Furnish and install necessary frames, bucks, sponge rubber gasketed, etc. to make a neat setting job.
- F. Diffusers shall be placed to insure that air does not blast against columns and lights.
- G. All diffusers, registers, etc. shall have external volume controls and deflecting grids.
- H. Ceilings in areas where plaster or gypsum board ceiling are used, shall be surface mounted.

END OF SECTION 23 37 00

DIVISION 26 – ELECTRICAL

SECTION 26 01 00 - GENERAL PROVISIONS - ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Work intended under this section consists of furnishing all labor and materials necessary to install new electrical work complete, including equipment, fixtures, switches, conduits, accessories, etc., ready for operation. Work includes the complete electrical installation of the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana**. Work includes the following, but this list in no way limits the scope of work involved and is issued only as a general scope of major items to be done.
- B. Complete electrical installation of the distribution system, including feeders, disconnect switches, panelboards, branch circuit wiring devices, etc.
- C. Provide a complete Fire Alarm System as described further herein.
- D. Provide a complete infrastructure for an Owner provided and installed Intercom/Clock System.
- E. Provide a complete Building Security System as described further herein.
- F. Provide a complete Data Network System of wiring solution cables, conduits surface raceways and terminations as described further herein.
- G. Furnish and install an Empty Conduit System.
- H. Provide a complete electrical system consisting of secondary feeders, branch circuits, wiring devices, panelboards, and disconnect switches as described further herein.
- I. Provide testing of electrical system as described herein.
- J. Provide inspection of the complete electrical system.
- K. Provide complete Operation and Maintenance manuals as described herein.
- L. Provide complete equipment labeling as described herein.

1.2 GENERAL REQUIREMENTS

- A. If an interference develops, the Designer is to make the decision for solution before any work is begun. If the work is completed and must be relocated due to conflict, such relocation shall be made without additional cost to the Owner. Check complete set of Plans in addition to work covered under this section so all conditions are taken care of and equipment and materials are furnished and installed to make a complete and satisfactory system in working order.

- B. Investigate conditions and furnish fittings, bends, junction boxes, pull boxes, etc., as required to meet conditions.
- C. All duplicate equipment supplied shall be of a single manufacturer.
- D. Submittal of bid shall indicate Contractor has examined site, Specifications and Drawings and has included all required allowances in his bid. Should Specifications or Drawings require items or installation not allowed by the governing authorities, the Contractor is obligated to call these items to the Designer's attention prior to bidding work.
- E. Utilities shown on Drawings have been obtained from existing Drawings and verbal information. Verify all services prior to bidding work.
- F. Exercise adequate planning and be responsible for timely placing of sleeves, conduit boxes, etc. Locations shown for fixtures, conduit, outlets, etc., are approximate and Designer reserves the right to make reasonable changes, without additional cost, before roughing-in.
- G. It is the intent of the Specifications and Drawings to describe complete electrical system in satisfactory operating condition. All work called for in Specifications and not shown on Drawings or shown on Drawings and not called for in Specifications, shall be performed as if described in both.
- H. The various trades shall cooperate in installing their work in order that there will be no conflict of space required by conduit, piping, ducts, outlets, etc.
- I. The Contractor shall provide temporary electrical service to all areas. This service shall include furnishing and connection of secondary feeders, transformers, temporary support, and electrical service to those areas to remain active and occupied during the course of construction. Coordinate with the Designer the methods and schedule of electrical work. This temporary service shall also include construction power to be used by the various Subcontractors on the job.
- J. It shall be the responsibility of the Contractor to determine a source for electric power to be used for construction purposes. The Contractor shall be allowed to obtain construction power from the closest source to the individual work areas. It shall be the responsibility of the Contractor to determine a source for electric power to be used for construction purposes and to make arrangements, pay deposits and usage, furnish and install equipment, poles, wiring, switches and outlets to provide adequate supply of electricity for lighting and power during construction. Meet applicable safety requirements as a minimum OSHA CPR 1927.269. Actual connection to obtain construction power shall only be performed with the approval and coordination of the User Agency. Meet applicable safety requirements.

1.3 LICENSE, LAWS, PERMITS AND FEES:

- A. Only bids of Contractors licensed under Act 233 of 1956 will be considered.

- B. Contractor shall submit documentation prior to beginning work, indicating license is in full force and of proper classification.
- C. Electrical work shall be installed in accordance with all governing codes and laws of the State of Louisiana in effect during time of construction.
- D. Applicable rules of National Electrical Code shall apply as minimum standard for work performed.

1.4 STANDARDS AND CODES

Where a referenced standard is indicated, the applicable standard shall be made a part of the specifications which refers to it to the same extent as if written out in the specification in full.

- A. Meet the requirements and recommendations of applicable portions of standards listed below:

I.E.E.E. Institute of Electrical and Electronic Engineers

N.E.M.A. National Electrical Manufacturer's Association

I.C.E.A. Insulated Cable Engineers Association

A.S.A. American Standards Association

A.E.I.C. Associated of Edison Illuminating Companies

O.S.H.A. Occupational Safety and Health Administration

Occupational and Health Standards; as a minimum CPR 1927.269
and CPR 1910.269

A.S.T.M. American Society for Testing Materials

U.L. Underwriters Laboratory

N.E.C. National Electrical Code

N.F.P.A. National Fire Protection Association

N.B.F.U. National Board of Fire Underwriters

A.N.S.I. American National Standards Institute

U.S.A.S.I. United States of America Standard Institute

- B. All standards referred to shall be current with latest addenda and supplements as of the date of the Contract Documents.
- C. Comply with all governing building and safety laws, ordinances and regulations relating to building and public health and safety laws having jurisdiction.

1.5 PERMITS AND INSPECTIONS

- A. Notify the Designer and the proper authorities in ample time when any work is ready for inspection or testing.
- B. Contractor shall assist in making periodic inspections or tests as required by Designer. Concealed conduit and wiring shall be inspected and checked by Designer before acceptance.
- C. Designer shall be notified at least 48 hours prior to tests or covering. Wiring or conduit system covered before being checked shall not be accepted.
- D. See individual specification sections for further tests and inspections.
- E. Contractor shall perform all tests in presence of Designer to show that the power and lighting loads are equally divided among phases of feeders serving each piece of equipment and each panelboard.
- F. Do not conceal any work until it has been tested and inspected.

1.6 CONDITIONS AT SITE

- A. Visit the site to be familiar with conditions under which work will be performed.
- B. Submittal of bid shall indicate Contractor has examined site, Specifications, and Drawings and has included all required allowances in his bid. Should Specifications or Drawings require items or installation not allowed by governing authorities, Contractor is obligated to call these items to the Designer's attention prior to bidding work.
- C. Utilities shown on Drawings have been obtained from existing Drawings and verbal information. Verify all services prior to bidding work.
- D. Provide a locked, weatherproof compartment for the storage of materials and apparatus which otherwise would be subject to weather damage, theft or vandalism.
- E. At all times, the Contractor shall take precautions necessary to properly protect his apparatus from damage. Failure on the part of the Contractor to comply with the above to the Designer's satisfaction will be sufficient cause for rejection of the particular piece of apparatus in question.

1.7 SUBSTITUTIONS

- A. For each proposed substitution, submit to the Designer at least seven (7) working days prior to bid date for prior approval, unless stated otherwise in the General Conditions. Submit sufficient manufacturer's data to indicate type, quality, and nature of actual equipment or materials proposed. Manufacturer's name alone is not adequate for approval. Where samples are required, submit production sample of actual item.
- B. Bids shall be based on materials and equipment as specified or prior approved in writing.
- C. The cost of any changes in design, installation, or the work of other trades, or delays in the work, resulting from substitutions, shall be the responsibility of the Contractor under this Division.

1.8 SHOP DRAWING APPROVALS

- A. Comply with requirements of General Conditions.
- B. All duplicate equipment supplied shall be by a single manufacturer. For all equipment listed below, the Contractor shall submit for approval six (6) sets of complete certified manufacturer's descriptive and performance data. No data will be considered unless the Contractor has indicated by his signature thereon, that he has reviewed it and found it complete and in order. Submittal data shall be assembled in bound sets, one copy each per set, and all unrelated data or illustrations on submittals shall be crossed out. The Designer will review submittals for conformity to Specifications and Drawings. If the submittals are rejected or returned to the Contractor "approved as noted," the Contractor shall then resubmit six (6) complete certified submittals with all corrections. If all conditions are met, the Designer will retain two (2) copies and return four (4) approved copies to the Contractor.
 - 1. Panel boards
 - 2. Lighting Fixtures
 - 3. Safety Switches
 - 4. Fire Alarm System
 - 5. Intercom System
 - 6. Security System
 - 7. Data Systems Components
 - 8. Public Address System
 - 10. Dry Transformers
- C. Corrections or comments made on shop drawings during this review do not relieve Contractor from compliance with requirements of Drawings and Specifications. This check is only for review of general conformance with design concept of the project and general compliance with information given in Contract Documents.

- D. Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all trades; and performing his work in a safe and satisfactory manner.

1.9 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instruct the User Agency's designated personnel in the operation and maintenance of the systems.
- B. Coordinate with the User Agency's designated personnel when factory technicians are available for start-up, testing and special instructions and procedures.
- C. Provide four (4) complete operating and maintenance manuals bound in hard binders. Include complete identification information, (manufacturer, model, type, serial number) descriptive and performance data, operating and maintenance instructions, replacement parts data, warranties, guarantees, and names and addresses of suppliers on the following items, before energization of any equipment.
 - 1. Panel boards
 - 2. Lighting Fixtures
 - 3. Safety Switches
 - 4. Fire Alarm System
 - 5. Security System
 - 6. Data Systems Components
 - 7. Dry Transformers

1.10 DRAWINGS

- A. Drawings are largely diagrammatic. Do not scale. Follow Architectural, Mechanical, Structural, and Shop Drawings for all dimensional information not specifically indicated on Electrical Drawings.
- B. Typical details are shown on the Plans, and in any cases where the Contractor is not certain about the method of installation of his work, he shall ask for details.
- C. Lack of details or information not requested shall not be construed as reason for improper installation. If the Contractor does not ask for details or clarification, and installs work incorrectly, he shall reinstall the work in accordance with instructions or details furnished, and do so at no extra charge.
- D. Lack of information not requested is no excuse for improper installation.
- E. Minor deviation will be permitted as long as quality, capacity, and performance are not jeopardized.

- F. General arrangement of work is indicated on Drawings. Contractor shall carefully examine Drawings and be responsible for proper fitting and operation of materials and equipment. Discrepancies, which prevent systems from functioning properly, shall be brought to attention of Designer prior to bid date.
- G. Because of small scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories required. The Contractor shall investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, access panels, and accessories required to meet such Specifications.

1.11 RECORD DRAWINGS

- A. Comply with requirements of General Conditions.
- B. Prior to final inspection, the Contractor shall deliver all record documents to the Designer who will prepare final record drawings and transmit same to Owner.
- C. Record changes in work caused by unforeseen difficulties. In the event of such changes, confer with Designer and obtain written consent before deviating from Drawings.
- D. Records shall indicate work as installed, and upon completion of construction, furnish an accurate drawing of electrical systems as actually installed.
- E. Provide additional drawings if required to accomplish the above.

1.12 GUARANTEE

- A. Guarantee the entire installation to be free of defects in materials and workmanship for one year from date of notice of final acceptance. The Contractor shall furnish free of cost to the Owner, materials and labor necessary to comply with this guarantee. See individual sections for warranties in excess of one year.
- B. Guarantee shall include performance capacities and characteristics.
- C. Unless specifically called for otherwise installation of all equipment shall be according to manufacturer's recommendations to maintain equipment guarantees.

END OF SECTION 26 01 00

SECTION 26 03 00 - TESTING

PART 1 - GENERAL

1.1 SCOPE

Before the electrical facilities for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana** are placed in operation, the Contractor shall make suitable tests to establish to the satisfaction of the Designer that all equipment, devices, and wiring have been correctly installed, are in satisfactory working condition, and will operate as intended. All electrical testing for entire project shall be provided under Division 26.

- A. The Designer reserves the right to witness all tests and he shall be notified one week before tests are to take place.
 - 1. The results (i.e. test values) of all tests described herein which are marked with an asterisk (*) shall be recorded on forms agreed upon by the Designer.
 - 2. Four (4) certified copies of the test data shall be given to the Designer.
 - 3. Upon completion of all other tests described herein, the Contractor shall submit to the Designer four (4) copies of a certified report attesting that each test has been performed in accordance with these conditions.
 - 4. Report shall include, for each test, the date of performance and name of the person in charge of the test.
- B. At least two weeks before field testing begins, the Contractor shall submit for review by the Designer a list of minimum acceptable test values the Contractor plans to follow for liquid dielectric strength, equipment dielectric absorption ratios, and insulation resistances for circuits and equipment. Values shall be at least equal to minimum values specified in manufacturer's instructions or applicable national standards.
- C. All measurements shall conform to established minimum acceptable test values. Designer reserves the right to approve all test results before circuits or equipment are energized for the first time.
- D. Individual measurements which fall below the average of like measurements on similar equipment by more than 25 percent shall be submitted to the Designer for specific approval even though they meet the minimum acceptable values.
- E. If motors or transformers must be dried to obtain required insulation resistance values, approval of the drying method shall be obtained from the Designer before applying heat.

PART 2 - PRODUCTS (NOT APPLIABLE)

PART 3 - EXECUTION

3.1 REQUIRED TESTS

A. *Tests on 600 Volt Conductors

1. All cable and leads shall be tested for continuity and, except for 120-volt services, shall be given a megger test.
2. All control cables shall be tested as detailed under "Control Cable."
3. Lighting circuits and other 120-volt services shall be tested during construction only for continuity and identification and shall pass operational tests to see that the circuits perform all functions for which they are designed.

B. Control Cable

1. This Specification covers the electrical tests required for acceptance for all single and multi-conductor control cables. Excluded from this Specification are such wires as telephone, data, intercommunication system, and thermocouple wires covered under other sections of this specification.
2. All control wires shall be checked for continuity and identification.
3. Continuity and identification shall be checked by means of a D-C test device using a bell or buzzer to "ring out" the wires. Phones may be used for communication only between the testers.
4. No control cable which contains shorted or grounded conductors as indicated by test shall be accepted.

C. Grounding Tests

1. Each ground strap shall be tested for proper grounding by applying a Ground Tester or equivalent instrument and using auxiliary ground rods. The resistance reading on any strap shall not exceed 1.0 ohms.
2. On new installations, all underground connections in the ground grid shall be given a visual inspection.
3. Equipment grounds shall show a resistance of 0.5 ohms or less to the ground grid or ground bus.

D. General Inspection Points

1. Inspect each circuit breaker for dust or foreign particles on the working surfaces; blow out with air or clean off with a suitable cleaning fluid.
2. Check all control circuits for proper operation.
3. Check all nameplates against manufacturer's drawings.
4. Check to be sure all pilot lights function properly.
5. Check operation of all circuit breakers.
6. Contractor shall thoroughly check all installations for proper operation.

END OF SECTION 26 03 00

SECTION 26 10 00 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE

- A. All items contained under Section 26 10 00 shall apply to all sections in Division 26 Electrical.
- B. Each item shall be new unless otherwise stated and shall bear the name of the manufacturer and shall be of the best quality obtainable, unless specified otherwise.
- C. All duplicate equipment shall be of a single manufacturer to include all facilities for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana.**
- D. Materials shall be of the type, design, and strength to satisfactorily accomplish the purpose intended.
- E. Each item shall conform with performance requirements, rules, codes, etc., to the testing, ratings, and quality of such items and they shall bear the stamp or seal of such approval.

1.2 WORKMANSHIP

- A. All work shall be performed in accordance with the best standards of practice by workmen skilled and qualified in the work to be done.
- B. Supervision and coordination of the work and the integration of all components into a complete, functioning system shall be the responsibility of the Contractor.
- C. Location of existing utilities and/or approved relocation or rerouting of proposed facilities to prevent interferences shall be the responsibility of the Contractor to accomplish at no additional cost to the Owner. Similarly, any damage to existing underground facilities shall be the responsibility of the Contractor and shall be repaired and/or replaced at no additional cost to the Owner.

1.3 SITE PREPARATION:

- A. The Contractor shall provide all clearing, grading and/or fill required to prepare the site as required for installation of the foundations required and shall be suitable for the purpose and be compacted as described further herein to the compaction of the surrounding undisturbed soil.

1.4 EXCAVATION AND BACKFILL:

- A. The Contractor shall provide all excavation necessary for installation of the foundations, underground conduit stub-outs, etc. See Architectural Specifications for applicable related items.

- B. Excavated earth shall be placed in locations so as not to endanger the excavation nor interfere with other work or required traffic.
- C. Width of excavations shall be the minimum necessary for proper installation of the facilities, with depths conforming as closely as possible to the required depth.
- D. The Contractor shall provide shoring, bracing, sheeting, etc., as required to provide stability for excavations and the remaining undisturbed soil, and/or as required to maintain integrity of adjacent structures or facilities. All such shoring, bracing, sheeting, etc., shall be removed upon backfilling.

Use of mechanical equipment for excavation shall be permitted. When in doubt as to existing underground facilities or at points where such utilities are known to exist, hand labor shall be used.

The Contractor shall locate and mark all underground utilities. Whether by hand labor or machine, all utilities damaged shall be the responsibility of the Contractor, and he shall repair or replace same to the satisfaction of the Designer.

- E. Placing of fill and/or backfilling shall be accomplished in maximum 8-inch layers using power tampers to obtain compaction equivalent to the surrounding undisturbed soil. Layers shall be continued and tamped until desired grade is obtained.
 - F. Placing of fill and/or backfilling of all excavations shall be to the satisfaction of the Designer, utilizing, where possible, previously excavated earth for backfill. However, broken asphalt, rocks, stones, concrete fragments or other foreign objects, or any materials which will soften or decompose such as lumber, rubbish, roots, frozen earth, etc., shall be removed from the backfill prior to its placement.
 - G. Any excess fill material shall be placed as directed by the Designer. Foreign material removed from fill or backfill shall be disposed of as directed by the Designer. Any fill requirements over and above the available from excavations shall be provided by the Contractor and shall be suitable for said purpose.
 - H. Sufficient pumping equipment shall be maintained to keep all excavations free of water.
- 1.5 CONCRETE WORK:
- A. Except as noted otherwise in the Drawings and/or Specifications, all concrete used shall be 3,000 psi at 28 days concrete.
 - B. Concrete used as conduit or cable protection shall be 1,500 psi minimum at 28 days concrete with an integral red dye added.
 - C. Forming of foundations, etc., shall be straight and true, with reinforcing and dimensions as called for on the Drawings.

- D. All exposed concrete shall be carefully and expertly finished with equipment foundations or pads sloped to drain with no pockets or low areas.
- E. Concrete shall be allowed to properly cure prior to being submitted to loading.

1.6 OPENING, CUTTING AND PATCHING:

- A. Cut all openings as required for the work under this Contract. Patching shall be done by the various crafts whose work is involved.
- B. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such times and in such a manner as not to delay or interfere with the work of other trades.
- C. Caulk, flash or otherwise make weatherproof, as directed by the Designer, all roof and exterior wall penetrations.
- D. Adequate protection shall be provided to avoid damage to existing surfaces during construction. Should damage occur, the surface shall be restored by patching, refinishing, repainting, reconstructing, or whatever process is necessary to restore the surface to its original condition. The Contractor shall be responsible for all required patchwork whether occasioned by his employees, Subcontractors, or material suppliers.

PART 2 - PRODUCTS

2.1 WIRING DEVICES

- A. Wiring devices shall be as listed (or prior approved equal) in the following table:

<u>Item</u>	<u>Slater</u>	<u>Leviton</u>	<u>Acuity</u>
Single Pole Toggle Switch	720-AG-IV	1221-I	
Single Pole Dimmer Switch		5574-POW	SPODMRD
Key Type Toggle Switch	720-AG-L-LH	1221-IL	
Duplex Receptacle	5362-AG-IV	5362-1	
Single Receptacle	536 I-AG-IV	5361-1	
Special Receptacles	RE: DRAWINGS		

Three-way
Toggle Switch

723-AG-IV

1223-I

2.2 DEVICE PLATES

- A. General purpose and specialty device plates as required shall be stainless steel. Where more than one switch or receptacle is ganged, the proper number of gangs on a one-piece ganged plate shall be used. All devices plates shall be attached with stainless steel security hardware (rejection pin torx fastener). Device plates shall be as listed (or prior approved equal) in the following table unless specially called for otherwise:

<u>Stainless Steel</u>	<u>Slater</u>	<u>Leviton</u>
Single Pole Toggle Switch	SSA-071	84001-40
Duplex Receptacle (120V)	SSA-101	84003-40
Single Receptacle (120V, 208V)	SSA-091	84004-40
Single Receptacle (208V, 1 Ph.)	SSA-381	84020-40
Weatherproof Receptacle (120V)	3780-SC	4929

- B. Mount switches on strike side of doors as finally hung. Grouped switches shall be installed in one box and covered with a one-piece ganged plate.

2.3 FLEXIBLE CONNECTIONS:

- A. Provide plastic-coated liquid tight flexible metal conduit with grounding type fitting for this purpose.
- B. 18 inches maximum shall be provided between motors or equipment and stationary conduit systems.

2.4 SAFETY SWITCHES:

- A. Indoor Safety switches, TO BE FURNISHED UNDER DIVISION 26, shall be without knockouts Type "Heavy Duty" fusible or non-fusible as required on Drawings. All switches shall be provided with ground kits. All indoor switches shall be NEMA Type 1 enclosures as listed (or prior approved equal) in the following table:

<u>Fusible</u> (240V, 3Ph, 4W)	<u>Square D</u>	<u>Cutler Hammer</u>
30A S/N	H321N/PK3GTA1	DH321NGK/DG030NB
60A S/N	H322N/PK3GTA1	DH322NGK/DG100NB
100A S/N	H323N/PK0GTA2	DH323NGK/DH100NK

200A S/N	H324N/PK0GTA2	DH324NGK/DH200NK
400A S/N	H325N/PK0GTA2(2)	DH325NGK/DS400NK
600A S/N	H326N/PK0GTA2(2)	DH326NGK/DS600NK
800A S/N	H327N/PK0GTA7	DH327NGK/DS800NK
1200A S/N	H328N/PK0GTA8	DH328NGK/DS800NK

Non-Fusible
(240V, 3Ph, 4W)

Square D

Cutler Hammer

30A S/N	HU361/PK3GTA1	DH321UGK/DG030NB
60A S/N	HU362/PK3GTA1	DH322UGK/DG100NB
100A S/N	HU363/PK0GTA2	DH323UGK/DH100NK
200A S/N	HU364/PK0GTA2	DH324UGK/DH200NK
400A S/N	HU365/PK0GTA2(2)	DH325UGK/DS400NK
600A S/N	HU366/PK0GTA2(2)	DH326UGK/DS600NK
800A S/N	HU367/PK0GTA7	DH327UGK/DS800NK
1200A S/N	HU368/PK0GTA8	DH328UGK/DS800NK

Fusible
(480V, 3Ph, 4W)

Square D

Cutler Hammer

30A S/N	H361N/PK3GTA1	DH361NGK/DG030NB
60A S/N	H362N/PK3GTA1	DH362NGK/DG100NB
100A S/N	H363N/PK0GTA2	DH363NGK/DH100NK
200A S/N	H364N/PK0GTA2	DH364NGK/DH200NK
400A S/N	H365N/PK0GTA2(2)	DH365NGK/DS400NK
600A S/N	H366N/PK0GTA2(2)	DH366NGK/DS600NK
800A S/N	H367N/PK0GTA7	DH367NGK/DS800NK
1200A S/N	H368N/PK0GTA8	DH368NGK/DS800NK

Non-Fusible
(480V, 3Ph, 4W)

Square D

Cutler Hammer

30A S/N	HU361/PK3GTA1	DH361UGK/DG030NB
60A S/N	HU362/PK3GTA1	DH362UGK/DG100NB
100A S/N	HU363/PK0GTA2	DH363UGK/DH100NK
200A S/N	HU364/PK0GTA2	DH364UGK/DH200NK
400A S/N	HU365/PK0GTA2(2)	DH365UGK/DS400NK
600A S/N	HU366/PK0GTA2(2)	DH366UGK/DS600NK
800A S/N	HU367/PK0GTA7	DH367UGK/DS800NK
1200A S/N	HU368/PK0GTA8	DH368UGK/DS800NK

- B. Outdoor Safety switches, TO BE FURNISHED UNDER DIVISION 26, shall be without knockouts Type "Heavy Duty" fusible or non-fusible as required on Drawings. All outdoor switches shall be NEMA Type 3R enclosures as listed (or prior approved equal) in the following table:

Fusible
(240V, 3Ph, 4W)

30A S/N
60A S/N
100A S/N
200A S/N
400A S/N
600A S/N
800A S/N
1200A S/N

Square D

H321NRB/PK3GTA1
H322NRB/PK3GTA1
H323NRB/PK0GTA2
H324NRB/PK0GTA2
H325NR/PK0GTA2(2)
H326NR/PK0GTA2(2)
H327NR/PK0GTA7
H328NR/PK0GTA8

Cutler Hammer

DH321NRK/DG030NB
DH322NRK/DG100NB
DH323NRK/DH100NK
DH324NRK/DH200NK
DH325NRK/DS400NK
DH326NRK/DS600NK
DH327NRK/DS800NK
DH328NRK/DS800NK

Non-Fusible
(240V, 3Ph, 4W)

30A S/N
60A S/N
100A S/N
200A S/N
400A S/N
600A S/N
800A S/N
1200A S/N

Square D

HU361RB/PK3GTA1
HU362RB/PK3GTA1
HU363RB/PK0GTA2
HU364RB/PK0GTA2
HU365R/PK0GTA2(2)
HU366R/PK0GTA2(2)
HU367R/PK0GTA7
HU368R/PK0GTA8

Cutler Hammer

DH321URK/DG030NB
DH322URK/DG100NB
DH323URK/DH100NK
DH324URK/DH200NK
DH325URK/DS400NK
DH326URK/DS600NK
DH327URK/DS800NK
DH328URK/DS800NK

Fusible
(480V, 3Ph, 4W)

30A S/N
60A S/N
100A S/N
200A S/N
400A S/N
600A S/N
800A S/N
1200A S/N

Square D

H361NRB/PK3GTA1
H362NRB/PK3GTA1
H363NRB/PK0GTA2
H364NRB/PK0GTA2
H365NR/PK0GTA2(2)
H366NR/PK0GTA2(2)
H367NR/PK0GTA7
H368NR/PK0GTA8

Cutler Hammer

DH361NRK/DG030NB
DH362NRK/DG100NB
DH363NRK/DH100NK
DH364NRK/DH200NK
DH365NRK/DS400NK
DH366NRK/DS600NK
DH367NRK/DS800NK
DH368NRK/DS800NK

Non-Fusible
(480V, 3Ph, 4W)

30A S/N
60A S/N
100A S/N
200A S/N
400A S/N
600A S/N
800A S/N
1200A S/N

Square D

HU361RB/PK3GTA1
HU362RB/PK3GTA1
HU363RB/PK0GTA2
HU364RB/PK0GTA2
HU365R/PK0GTA2(2)
HU366R/PK0GTA2(2)
HU367R/PK0GTA7
HU368R/PK0GTA8

Cutler Hammer

DH361URK/DG030NB
DH362URK/DG100NB
DH363URK/DH100NK
DH364URK/DH200NK
DH365URK/DS400NK
DH366URK/DS600NK
DH367URK/DS800NK
DH368URK/DS800NK

The above are minimum sizes to be used. Size disconnects according to load served or as shown on Drawings.

2.5 LABELING

- A. For all equipment, Contractor shall furnish laminated labels fastened to starter with tamperproof stainless-steel hardware.
- B. Labels shall be black letters on a white field. See Drawings for details.
- C. Contractor shall also furnish appropriately sized heaters for all motors based on their full load ampere nameplate rating.

2.6 SPECIALTITY INGROUND EMPTY JUNCTION BOXES

- A. Provide inground junction boxes suitable for the application to be placed adjacent to the sports field.
- B. Junction box shall be nominal 1'-6" long and 1'-3" wide and 1'-2" deep from bottom of junction box to finished grade and shall be made of minimum 3/16" aluminum.
- C. Junction box shall be complete with built in 1" minimum drain stub for connection to subsurface drainage system.
- D. Junction box shall be complete with lockable square hand hole cover with hex key lock and lockable recessed main aluminum lid shall be recessed to accept synthetic track surface. Leveling bolts shall be provided in four corners for leveling the junction box.
- E. Junction boxes shall be as manufactured by Sportsfield Specialties or prior approved equal.

2.7 SPECIALTITY INGROUND POWERED JUNCTION BOXES

- A. Provide inground two gang junction boxes suitable for the application to be placed adjacent to the sports field.
- B. Junction box shall be nominal 16" long and 8 3/4" wide and 10 3/4" deep and be complete with tamper-resistant key and lock egress door.
- C. Junction box shall be complete with two (2) 3/4" to 1 1/4" trade size feed locations for connection to branch circuits.
- D. Junction box shall be NEMA 6P rated wiring enclosure and shall be complete with two 20A duplex weather resistant receptables as needed for the application.
- E. Junction box shall be NEMA 6P rated wiring enclosure and shall be complete with audio sound system and data devices (AVIP) as needed for the application.

- F. Junction boxes shall be "Outdoor Ground Box" as manufactured by Legrand Wiremold.

2.8 SPECIALTITY INGROUND SPECIAL SYSTEM JUNCTION BOXES

- A. Provide inground junction boxes suitable for the application to be placed adjacent to the sports field.
- B. Junction box shall be nominal 16" long and 8 3/4" wide and 10 3/4" deep and be complete with tamper-resistant key and lock egress door.
- C. Junction box shall be complete with two (2) 3/4" to 1 1/4" trade size feed locations for connection to branch circuits.
- D. Junction box shall be complete with 8-port AVIP device mounting plate and a 12-port communications device plate.
- E. Junction box shall be NEMA 4X rated wiring enclosure and shall be complete with audio sound system and data devices (AVIP) as needed for the application.
- F. Junction boxes shall be "Outdoor Ground Box" as manufactured by Legrand Wiremold.

2.9 FUSES

- A. Fuseholders shall be provided with dual-element, timelag fuses, Bussmann FRN-R or FRS-R Series or Chase Shawmut AT-DE Series, sized as required according to manufacturers recommendations unless shown otherwise on Drawings.
- B. Fuses shall have a minimum of 200,000 amperes interrupting capacity.
- C. Provide to the User Agency a 10% spare fuse supply for each different fuse type and size used, but in no case less than 3 fuses for each size and type.

2.10 GROUNDING

- A. Conduit work, motors, panelboard and the other electrical equipment shall be effectively grounded as required by all governing codes.
- B. Refer to grounding section of these Specifications (Section 26 45 00).

2.11 CONDUIT ITEMS

A. MATERIAL SPECIFICATIONS

- 1. Schedule 40 PVC conduit shall be used for all branch circuits, control wiring, branch runs for telephone and data locations and similar runs underground.
- 2. Rigid galvanized steel conduit or rigid aluminum conduit shall be used for runs exposed unless shown otherwise.

3. EMT conduit shall be used in concealed or exposed interior spaces.
4. All underground 90-degree bends and risers for panel feeders, risers for receptacles, switches, etc., shall be rigid galvanized steel conduit.
5. See Drawings for details.

B. FLEXIBLE CONDUIT

1. Short lengths of flexible metal conduit, 18 inches maximum, shall be used for connections such as to motors on sliding baseplates, extensions from wireways or continuous rigid cable supports.
2. Flexible conduit for all locations shall have a liquid tight thermosetting or thermoplastic outer jacket unless shown otherwise.
3. Flexible metallic conduit for connections to lighting fixtures from junction box will be acceptable provided maximum length of flexible metallic conduit is limited to 6 ft.
4. Use of prewired flexible "BX" type conduit shall not be allowed. However, the use of "MC" type cable shall be allowed for all lighting and power branch circuits #10 and below.

C. NONMETALLIC CONDUIT

1. For underground or encased conduit Type 40 heavy wall PVC conduit and fittings may be used, but all exposed routing, etc., shall be rigid galvanized steel elbows.
2. See Conduit Items: Materials Specifications for allowable uses of PVC conduit and Drawings for details.

2.12 WIREWAY SYSTEMS

- A.** Wireways shall be Circle A-W GRT Series, Square D RD Series or shop fabricated in accordance with the following:
1. They shall be fabricated from sheet steel of not less than .0897 inches (No. 13 USS gauge) or aluminum alloy sheet of not less than 0.125-inch thickness.
 2. All surfaces shall have a corrosion resistant enamel finish.
 3. Wireways shall be suitable for interior or exterior installation as needed for the application.
 4. Section of wireways may be joined together and supported by any means which insures continued rigidity and alignment without sacrificing ease of cable installation or cable replacement.

5. They shall have provisions for future cable entrances at least every 3 feet along their length.

- B. Wires and cables shall be run in one length. Where required, splices and taps shall be located within the wireway in an accessible location.
- C. Cables shall be loosely laid in the wireway with a minimum number of crossovers. The sum of the cross-sectional areas of all contained conductors at any cross-section of a wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.

2.13 EXPANSION CONDUIT FITTINGS

- A. Furnish and install conduit expansion fittings on all conduit crossing building expansion joints. Fittings shall be metal construction with bonding jumper for rigid galvanized conduit and plastic construction for PVC conduit.

2.14 SWITCH/OUTLET BOXES

- A. Where boxes are installed in a concrete slab, boxes designed for this application shall be used.
- B. Receptacles, switchboxes, manual motor starters, etc., on exposed conduit shall be cast aluminum Type FS, FD or equivalent. Universal cast boxes with extra knockouts closed with plug shall not be acceptable. Cover plates shall cover box with no overlap. Galvanized handy boxes, with or without pre-punched conduit entrances, etc., shall not be used.
- C. All exterior boxes shall be cast aluminum as described above and be provided with suitable neoprene gaskets to prevent entrance of water or other contaminants into the box.

2.15 PULL BOXES

- A. Furnish and install pull boxes as required.
- B. Boxes shall be code gauge galvanized with screw attached access panels in top, side or bottom, as required.
- C. Boxes shall be large enough to comply with code requirements.
- D. All pull boxes shall be fully accessible after installation of entire project.

2.16 INSULATED WIRE AND CABLE

- A. For conduit installations, wires and cables shall be pulled into conduit in one piece between termination or splice points.

- B. Wire and cables shall be liberally coated with a pulling lubricant compatible with the type insulation used. Grease shall not be used as lubricant for wires and cables having neoprene or other nonmetallic exterior jackets.
- C. The pulling tension on cables shall be limited to the maximum tension recommended by the cable manufacturer.
- D. No wire shall be pulled into conduit until all work of a nature which would cause damage has been completed.
- E. Joints or splices in 120/208-volt and 277/480-volt conductors shall be made with acceptable nonmetallic body, metallic spring, screw on type fittings unless shown otherwise on drawings.
- F. Connectors of the nonmetallic body, metallic spring, screw-on type shall be Ideal Cat. No. 451 or 454, Buchanan Cat. No. BI or B2, or Scotch Cat. No. Y or R. At outlet for fixtures, pig tails of building wire shall be left for splicing to fixture wire after all other connections have been made up and fitting into the box.
- G. Mains and feeders shall be run their entire length without joints or splices.
- H. Connectors of the acceptable compression type shall be Panduit "JN" Series or Scotch S-II and S-31 Series.
- I. Joints other than self-insulating types shall be carefully taped after inspection to the full insulation class of the wire with plastic tape; Scotch 33+ or Plymouth 4240.
- J. Wire and cable terminations at motors shall be made with lug type compression connectors. These shall be connected to lug connectors on the motor terminal leads (or to terminal studs) with corrosion resistant bolts, nuts, washers or lock washers.
- K. Wire used this project shall be of soft drawn annealed copper having a conductivity of no less than 98 percent of that of pure copper, unless shown otherwise on the drawings.
- L. Unless otherwise specified or noted, conductors shall be stranded Type THWN 600 volt for sizes through No. 8 for general use and use in damp locations.
- M. Wire No. 8 and larger shall be stranded RHW/USE 600 volt for general use and use in damp locations.
- N. Wire shall be constructed with insulating properties, surface marking, etc., according to applicable Standards and Codes listed in Section 26 01 00 and further herein.
- O. No wire shall be smaller than No. 12 for power or lighting service, or smaller than No. 14 for controls. Wire for branch circuits shall be the same from the panelboard to the last outlet on the circuit. All wire #8 and above shall be stranded.

- P. In lighting system, conductors shall be identified by color coding, and green grounded conductor shall be connected to screw shell of lamp sockets and shall be uniform through this installation. The color-coding shall be continuous the full length of wire No. 8 or smaller, and on larger wire permanent paint bands or tags at outlets will be accepted.
- Q. No wire shall be drawn into a conduit until all work of which may cause damage is complete.
- R. Color coding of conductors shall be as follows;
1. All conductors up to and including #8 AWG shall be color coded to indicate voltage and phase.
 2. All conductors from #6 and up shall be color coded with either tape within 2" of each end or continuous jacket color to indicate voltage and phase as follows.

	<u>120/208</u>	<u>277/480</u>
Phase A	Black	Brown
Phase B	Red	Purple
Phase C	Blue	Yellow
Neutral	White/Gray	Grey/White
Ground	Green	Green

PART 3 - EXECUTION

3.1 OTHER CONNECTIONS:

- A. Provide complete electrical connection for equipment indicated for installation under other sections or by User Agency.
- B. Where required, provide or change cords and plug. Cords shall be heavy neoprene sheathed "SO" types with grounding conductor.
- C. Connect and provide grounding plug to fit receptacles where required.
- D. Conductor size shall be per manufacturer's recommendations.

3.2 MOUNTING HEIGHTS

- A. Unless otherwise noted on the Drawings or directed by the Designer, the following mounting heights shall apply above finished floor.
- B. Devices shall not cross a mortar joint. If crossing mortar joints is unavoidable, the device shall be mounted flush, with grouting added as required to fill all voids.

Panelboards	6'6" AFF to top or 6" AFF to bottom for larger panels
Receptacles	18" AFF

Receptacles above countertop	6" above countertop (Coordinate w/counter installer and/or manufacturer) before rough-in
Special System Outlets	18" AFF
Toggle Switches	4'-0" AFF or as required to comply with ADDAG
Intercom Call Buttons	4'-0" AFF or as required to comply with ADDAG
Fire Alarm Station	4'-0" AFF or as required to comply with ADDAG

3.3 CONDUIT INSTALLATION

- A. All feeders, branch circuits, etc., which are installed underground shall be Schedule 40 PVC, except for the 90-degree bend underground which shall be rigid galvanized steel conduit. See Drawings for details.
- B. All 90-degree bends and risers for panel feeders, risers for receptacles, switches, etc., shall be rigid galvanized steel conduit. See Drawings for details.
- C. 1/2" conduit shall be the minimum size conduit accepted on project.
- D. Where rigid steel conduit is specified, it shall be galvanized heavy wall steel conduit or intermediate metal conduit with galvanized fittings as required.
- E. All cable shall be liberally coated with cable pulling lubricant, compatible with the type of insulation used, prior to pulling any conductors.
- F. All wires and terminals shall be identified and tagged with sleeve type tags.
- G. Nametags shall be installed on all equipment as specified on the Drawings.
- H. All conduits shall be swabbed clean before wire or cable is installed. In addition, before cable installation, a test mandrel having a diametrical clearance of not more than 1/2-inch compared to the conduit interior diameter shall be drawn through all conduits to be used for main distribution feeders.
- I. All exposed conduit runs shall be adequately supported. The spacing between conduit clamps or other supports shall be kept short enough to prevent sagging in horizontal conduit runs. Conduit shall be supported at no greater than 6 feet on centers and no more than 2 feet from electrical device, equipment or appliances.
- J. A minimum spacing of 1 inch shall be maintained between the outside surfaces of underground conduits 1-1/2 inches and smaller, and 2 inches shall be maintained between conduits 2 inches and larger.
- K. The bottom of trenches for underground duct banks shall be level. If soil cannot support the duct bank without settling, a concrete mat, reinforced if necessary, shall be provided along the trench bottom.
- L. Underground conduits shall be installed a minimum of 18 inches below grade.

- M. Furnish and install inserts and hangers required to support conduit, cables, pull boxes, etc. If any of these items are improperly installed, Contractor, at his own expense, shall do all necessary cutting, patching to rectify the errors.
- N. Flashing for electrical conduit projecting through or mounted on roof provided under this section. All flashing to conform to details and requirements of National Roofing Contractors' Association and as directed by Designer.
- O. Conduit stub-ups through paved surfaces and foundations shall be adequately braced to prevent shifting during pouring of the concrete.
- P. All underground conduit runs shall be encased in RED concrete, unless installed under building slab. Concrete shall have a minimum strength of 1,500 pounds and shall be colored red with a permanent coloring additive integrally mixed with the concrete. The minimum thickness encasement shall be 3 inches on top, sides, and bottom. If conduits rise above ground, the encasement shall extend 6 inches above ground. The top of the concrete encasement shall be a minimum of 18 inches below grade. At road crossings, the top of the encasement shall be a minimum of 30 inches below the road surface or rail base, unless shown otherwise on Drawings.
- Q. All underground conduits shall be securely tied to PVC or concrete spacers to prevent shifting, and shall be weighted or anchored as necessary to prevent floating when the concrete encasement is poured. Spacers shall not be left exposed or protruding through concrete encasement. Concrete encasement shall be poured so as to be monolithic insofar as possible. If joints in the encasement are necessary, the surface of the concrete at the joint shall be treated to insure a good bond before the next section is poured.
- R. Where impossible to install the exposed conduit, due to structural requirements or building construction, the conduit shall be securely attached as possible. Notify Designer before any structural member is chased or cut and obtain approval before proceeding. Location of all exposed conduit shall be subject to Designer's approval.
- S. All conduits shall bear the inspection label of the Underwriters Laboratories, Inc.

3.4 INSTALLATION REQUIREMENTS FOR RIGID CONDUIT SYSTEMS

- A. Conduits shall not be run close to parallel hot lines or large high temperature surfaces.
- B. Conduit shall not be run nearer to covering of steam or hot water pipes than 3 inches except where crossing is unavoidable.
- C. Conduit shall be kept at least 1 inch from covering of pipe crossed.
- D. Exposed conduit shall be installed with runs parallel or perpendicular to walls with uniform and symmetrical elbows, offsets and bends.

- E. All conduit entering and leaving a pull point, switchrack, or any other particular congregation of conduits leaving or entering as a group shall be "fanned-in" or "fanned-out" using the largest practical bending radius. "Factory" bends shall not be used.
- F. Conduit shall be held securely in place by approved hangers and fastenings, of appropriate design and dimensions for the particular application.
- G. Acceptable supporting and clamping material for exposed conduit includes malleable iron one-hole clamps with clamp backs, suspension pipe rings with 3/8-inch hanger rods, and standard galvanized steel 1-5/8 inch square supporting material.
- H. All exposed hardware shall be of cadmium plated design.
- I. Perforated steel tape, wire hangers, stamped steel straps and similar materials shall not be used in exposed locations.
- J. Hangers and other fastenings shall be supported on solid masonry with inserts or expansion sleeves and bolts; wood with wood screws; hollow masonry and cement wall panels with toggle bolts and steel with machine screws or welded threaded studs.
- K. Unless specified otherwise, rigid conduit shall be supported at no greater than 6 feet on centers.
- L. All exposed conduit shall be fastened as securely as possible with appropriate cadmium plated hardware.
- M. Where they enter boxes or cabinets, conduits that do not have threaded hubs shall be secured in place with galvanized locknuts inside and outside and shall have galvanized bushings inside except that conduits 1-1/4 inches and larger shall have galvanized locknuts and insulating bushings.
- N. All locknuts shall be of the bonding type, which penetrate the enclosure surface when tightened. Set screw type conduit connectors shall not be allowed.
- O. All exterior conduits shall enter boxes or cabinets through a gasketed threaded hub sized as required. Hubs shall include all locknuts and seals to assure weather tightness. Do not enter exterior cabinets, boxes, devices, etc., from the top.
- P. Conduit penetration through floor shall be galvanized rigid elbows at all locations.
- Q. Leave a #12 AWG pull wire in each empty conduit.
- R. Conduit bends shall be reasonably free of flat surfaces and kinks or dents. Bends in conduit 1-1/2 inches in diameter and larger shall be made with a bending machine. Bending radii shall be 18 inches for 1-1/2 inch conduits and 24 inches for 3-inch and 4-inch conduits unless specified otherwise on the Drawings. Note this is the radius of the bend, not the bend size.

- S. All rigid metal conduit joints and connections shall be made up using a suitable conducting sealing compound or thread lubricant to insure a tight joint and to prevent steel conduit threads from rusting. Rigid metal conduit joints and connections shall be screwed up tight using wrenches to insure good conductivity.
- T. All conduits shall be clean before erection. Cut ends shall be reamed free of burrs. During construction, all installed conduit shall be capped with malleable iron pipe caps to prevent entrance of water or other foreign matter. Conduits designated as "spare" shall be left capped, containing a #12 AWG pull wire.

3.5 ELECTRICAL CONNECTIONS

- A. The Contractor shall insure the temperature rating associated with the ampacity of a conductor shall be so selected and coordinated as to not exceed the lowest temperature rating of any connected termination, conductor or device as further described in NEC Article 110-14, C (2000 volt and below) and 110-40 (2001-35,000 Volt).

3.6 PHASE SEQUENCE

- A. Connections shall be made at switchgear and motor control equipment to maintain the same physical arrangement of phases throughout the system. All feeder cables shall be phase sequence marked permanently.

END OF SECTION 26 10 00

SECTION 26 16 30 - DISTRIBUTION PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

- A. This section includes the specifications of the distribution panelboards for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana.**

1.2 SECTION INCLUDES

- A. 120/208V Three phase distribution panelboards.
- B. 480/277V Three phase distribution panelboards.

1.3 RELATED WORK

- A. Section 26 01 00: General Provisions – Electrical
- B. Section 26 10 00: Basic Materials and Methods

1.4 STANDARDS AND CODES

- U.L. Underwriters Laboratories, Inc.
- N.F.P.A. National Fire Protection Association
- N.E.C. National Electric Code (NFPA 70)
- N.E.M.A. National Electrical Manufacturer's Association

1.5 SUBMITTALS

- A. Submit shop drawings under provisions of Section 26 01 00.
- B. Submit Operation and Maintenance data under provisions of Section 26 01 00.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 26 01 00.
- B. Store and protect products under provisions of Section 26 01 00.

PART 2 - PRODUCTS

2.1 THREE PHASE DISTRIBUTION PANELBOARDS

- A. Panelboards shall be circuit breaker type using quick make, quick break, trip-free circuit breakers with minimum AIC interrupting ratings as shown on the Drawings or specified herein.
- B. Two and three pole breakers shall be common trip.
- C. Include ground fault circuit interrupters on all breakers feeding weatherproof receptacles and other areas as noted on Plans.
- D. Panelboards shall be deadfront, safety with main breakers or main lugs, and number and size of breakers as shown on the Drawings.
- E. Panelboards shall have single, feed through, or double lugs to accommodate feeder conductors as shown on the Plans.
- F. Voltages and main circuit breaker or main lugs as specified on Plans.
- G. Enclosures shall be suitably sized to accommodate both the main conductors and all feeder branch circuit conductors.
- H. All circuit breakers shall be rated for switching duty.
- I. All circuit breakers shall be rated for full interrupting values shown.
- J. Series rating shall not be allowed.
- K. Doors shall be fitted with flush cylinder locks, keys to which shall be all alike; 2 keys shall be furnished for each lock.
- L. Cabinet fronts shall be furnished with baked enamel finish.
- M. Provide with each panelboard a directory framed with transparent plastic window on inside of door and place therein a typewritten identification of all circuits.
- N. All panelboards shall be labeled as shown on the drawings. Labels shall be constructed of laminated plastic 1/8" thick white letters on black field fastened with stainless steel screws.
- O. Panelboards shall be completely factory assembled. All equipment purchased shall be of a single manufacturer.
- P. Cabinet shall be galvanized steel with enameled trim, constructed in conformance with NEC, NEMA, and IEEE requirements and shall bear the Underwriter's Laboratories stamp of approval for the service intended.

- Q. Main ampere capacity shall be as called for on the Plans.
- R. All bus work shall be tin-plated copper.
- S. All neutral bus shall be rated 200%.
- T. Branch circuit breakers for 120/208-volt panelboards shall have a minimum AIC as shown on the drawings.

2.2 TRANSIENT VOLTAGE SURGE SUPPRESSION

- A. Transient voltage surge suppression (TVSS) shall be in accordance with the following standards:
 - a) Underwriters Laboratory (UL)
 - b) American National Standards Institute (ANSI)
 - c) Institute of Electrical and Electronics Engineers (IEEE)
 - d) National Electrical Manufacturers Association (NEMA)
 - e) National Fire Protection Association (NFPA)
 - f) Occupational Safety and Health Act (OSHA)
 - g) Federal Information Processing Standards, Pub 94 (FIPS)
 - h) ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits, Category C.
 - i) ANSI/IEEE C62.45, Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
 - j) UL 1449, Current Edition – Transient Voltage Surge Suppressors
 - k) NEMA LS-1 (1992), Low Voltage Surge Protective Devices
 - l) NEC Article 285
- B. Manufacturers meeting these requirements will be accepted. Submittal information shall include Test Reports from a NRTL (R&B Labs preferred) showing single impulse testing matching label rating, including fuses, UL documents showing SVR ratings and symmetrical fault current withstand ratings, and NRTL report showing the device capable of surviving a minimum of 5,000 impulses using 10x1000 s waveform.
- C. Electrical Requirements:
 - a) System voltage shall be as indicated on drawings.
 - b) The TVSS shall be UL Tested and Labeled as a complete assembly to a symmetrical fault current rating greater than or equal to the rating of the connected panel, in accordance with NEC Article 285, without the requirement of a dedicated breaker feeder to obtain the fault current withstand rating.

- c) The Suppression Voltage Rating (SVR) shall be tested with the integral disconnect in accordance with UL-1449, Second Edition. The UL SVR values shall not exceed the following (including disconnect). If the device is remote mounted it shall be fed by a circuit breaker and the UL SVR rating shall include the breaker in series with the TVSS.

SVR Values Wye Module:

120/208 volt – L-N 400, N-G 400, L-G 400

277/480 volt – L-N 800, N-G 800, L-G 800

- D. Protection and Filtering Elements – The TVSS shall have a maximum surge current rating of:

Service Entrance	100kA per mode
Distribution Panel	100kA per mode
Branch Panel	80kA per mode

- E. Devices that derive a maximum surge current rating by adding test results of individual components are not acceptable. Systems using selenium, gas tubes or silicon avalanche diodes in surge current path are not acceptable. The Maximum Continuous Operating Voltage (MCOV) for all voltage configurations shall be 115% of nominal or greater.

- F. Standard Monitoring features:

- a) Operational status indicating lights.
- b) Audible alarm and alarm indicating light and test switch.
- c) Dry contacts for remote monitoring purposes.
- d) Transient voltage surge counter.

- G. Equipment Mounting

- a) Switchboard & Distribution Panel TVSS – The TVSS device shall include an integral disconnect switch which has been tested to the surge current rating of the TVSS and match or exceed the fault current rating of the board per NEC 285. The Disconnect shall switch the phases and neutral. The TVSS shall be mounted integral to the switchboard.
- b) Branch panel TVSS – The TVSS device shall be direct bus to bus connected or wall mounted. Use of a breaker to feed an integral device shall not be acceptable.

2.3 MANUFACTURES

- A. Panelboard shall be Square D Type I-Line, Eaton P1A, Siemens/ITE Type CDP, General Electric A Series, Cutler Hammer Type MP40 or Challenger Type LDP and BDP Series for 120/208 volts, 3 phase, 4 wire.

2.4 ELECTRIC SERVICE STUDIES

- A. Standard: Submit studies in accordance with ANSI/IEEE Standard 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
- B. Submit one-line diagram for each electrical service. Key all equipment and components on diagram to items in the studies.
- C. Provide a short-circuit current analysis for each main panelboard. Short-circuit analysis shall calculate short-circuit levels at service transformer secondary, panelboard main breaker, each feeder breaker and all levels of downstream distribution equipment. Assume infinite source bus.
- D. Provide a time-current coordination study for each main panelboard. Coordination study shall compare the operating levels and times of the protective devices to the withstand levels and times that the equipment can sustain without damage or failure. Determine electronic trip unit settings necessary to achieve optimal selective coordination between 480-volt main service circuit breaker and first level of feeder distribution devices. Determine setting for all adjustments of trip units of all electronic circuit breakers that are linked by zone-selective interlocking. Furnish time-current curves for the two (or more) levels of distribution protected with electronic trips, plus the first additional distribution level served from the panelboard feeder. Show a separate composite plot for each feeder breaker trip rating with the main breaker. Plot composite time-current curves on log-log background. Add a typical frame size of downstream molded-case circuit breaker to each panelboard feeder composite plot.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Do not purchase panelboards or cabinets until Shop Drawings have been approved.
- B. Circuit numbering and phase connections shall be in accordance with the following:

1. In lighting and appliance branch panelboards having two vertical columns of devices, circuit numbering shall be such that, starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side.
2. See schedule of panelboards on Drawings for circuit device sizes and number of poles.

3.2 ELECTRICAL CONNECTIONS

- A. The Contractor shall insure the temperature rating associated with the ampacity of a conductor shall be so selected and coordinated as to not exceed the lowest temperature rating of any connected termination, conductor or device as further described in NEC Article 110-14, C (2000 volt and below) and 110-40 (2001-35,000 volt).

END OF SECTION 26 16 30

SECTION 26 16 40 - BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

This work includes the following items for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana.**

- A. 120/208V Three phase distribution panelboards.
- B. 480/277V Three phase distribution panelboards.

1.2 RELATED WORK

- A. Section 26 01 00: General Provisions – Electrical
- B. Section 26 10 00: Basic Materials and Methods

1.3 STANDARDS AND CODES

- U.L. Underwriters Laboratories, Inc.
- N.F.P.A. National Fire Protection Association
- N.E.C. National Electric Code (NFPA 70)
- N.E.M.A. National Electrical Manufacturer's Association

1.4 SUBMITTALS

- A. Submit shop drawings under provisions of Section 26 01 00.
- B. Submit Operation and Maintenance data under provisions of Section 26 01 00.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 26 01 00.
- B. Store and protect products under provisions of Section 26 01 00.

PART 2 - PRODUCTS

2.1 THREE PHASE BRANCH CIRCUIT PANELBOARD

- A. Panelboards shall be circuit breaker type using quick make, quick break, bolt-on type trip-free circuit breakers with minimum AIC interrupting ratings as shown on the Drawings or specified herein.
- B. Two and three pole breakers shall be common trip.

- C. Include ground fault circuit interrupters on all breakers feeding weatherproof receptacles and other areas as noted on Plans.
- D. Panelboards shall be dead front, safety with main breakers or main lugs, and number and size of breakers as shown on the Drawings.
- E. Panelboards shall have single, feed through, or double lugs to accommodate feeder conductors as shown on the Plans.
- F. Voltages and main circuit breaker or main lugs as specified on Plans.
- G. Enclosures shall be suitably sized to accommodate both the main conductors and all branch circuit conductors.
- H. All circuit breakers shall be rated for switching duty.
- I. All circuit breakers shall be rated for full interrupting values as shown.
- J. Series rating shall not be allowed.
- K. Door shall be fitted with flush cylinder locks, keys to which shall be all alike; 2 keys shall be furnished for each lock.
- L. Cabinet fronts shall be furnished with baked enamel finish.
- M. Provide with each panelboard a directory framed with transparent plastic window on inside of door and place therein a typewritten identification of all circuits.
- N. All panelboards shall be labeled as shown on the drawings. Labels shall be constructed of laminated plastic 1/8" thick white letters on black field fastened with stainless steel screws.
- O. Panelboards shall be completely factory assembled. All equipment purchased shall be of a single manufacturer.
- P. Cabinet shall be galvanized steel with enameled trim, constructed in conformance with Standards and Code requirements as listed in Section 26 01 00 and shall bear the Underwriter's Laboratories stamp of approval for the service intended.
- Q. Main ampere capacity shall be as called for on Drawings.
- R. All bus work shall be tin-plated copper.
- S. All neutral bus shall be rated 200%.

2.2 MANUFACTURERS

- A. Panelboard shall be Square D Type (NQOD), Eaton P1A, Siemens/ITE CDP Series, General Electric A Series, Cutler Hammer Type CHB, Challenger Type LP Series for 120/208 volts, 3 Phase, 4W. Panelboard shall be Square D Type (NEHB), Eaton P1A, Siemens/ITE Sentron Series, Cutler Hammer Type POW-R-LINE Series for 480/277 volts, 3 Phase, 4W. Branch breakers shall have a minimum 18,000 AIC interrupting rating (unless shown otherwise on drawings).

2.3 ENCLOSED CIRCUIT BREAKERS

- A. Enclosed circuit breakers shall be of same construction as similar breakers described above.
- B. Enclosures shall be NEMA 1, unless shown otherwise on Drawings.
- C. Main ampere capacity shall be as called for on Drawings.
- D. All bus work shall be tin-plated copper.

2.4 TRANSIENT VOLTAGE SURGE SUPPRESSION

- A. Transient voltage surge suppression (TVSS) shall be in accordance with the following standards:
 - a) Underwriters Laboratory (UL)
 - b) American National Standards Institute (ANSI)
 - c) Institute of Electrical and Electronics Engineers (IEEE)
 - d) National Electrical Manufacturers Association (NEMA)
 - e) National Fire Protection Association (NFPA)
 - f) Occupational Safety and Health Act (OSHA)
 - g) Federal Information Processing Standards, Pub 94 (FIPS)
 - h) ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits, Category C.
 - i) ANSI/IEEE C62.45, Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
 - j) UL 1449, Current Edition – Transient Voltage Surge Suppressors
 - k) NEMA LS-1 (1992), Low Voltage Surge Protective Devices
 - l) NEC Article 285
- B. Manufacturers meeting these requirements will be accepted. Submittal information shall include Test Reports from a NRTL (R&B Labs preferred) showing single impulse testing matching label rating, including fuses, UL documents showing SVR ratings and symmetrical fault current withstand ratings, and NRTL report showing the device capable of surviving a minimum of 5,000 impulses using 10x1000 s waveform.
- C. Electrical Requirements:
 - a) System voltage shall be as indicated on drawings.

- b) The TVSS shall be UL Tested and Labeled as a complete assembly to a symmetrical fault current rating greater than or equal to the rating of the connected panel, in accordance with NEC Article 285, without the requirement of a dedicated breaker feeder to obtain the fault current withstand rating.
- c) The Suppression Voltage Rating (SVR) shall be tested with the integral disconnect in accordance with UL-1449, Second Edition. The UL SVR values shall not exceed the following (including disconnect). If the device is remote mounted it shall be fed by a circuit breaker and the UL SVR rating shall include the breaker in series with the TVSS.

SVR Values Wye Module:

120/208 volt – L-N 400, N-G 400, L-G 400

277/480 volt – L-N 800, N-G 800, L-G 800

- D. Protection and Filtering Elements – The TVSS shall have a maximum surge current rating of:

Service Entrance	100kA per mode
Distribution Panel	100kA per mode
Branch Panel	80kA per mode

- E. Devices that derive a maximum surge current rating by adding test results of individual components are not acceptable. Systems using selenium, gas tubes or silicon avalanche diodes in surge current path are not acceptable. The Maximum Continuous Operating Voltage (MCOV) for all voltage configurations shall be 115% of nominal or greater.

- F. Standard Monitoring features:

- a) Operational status indicating lights.
- b) Audible alarm and alarm indicating light and test switch.
- c) Dry contacts for remote monitoring purposes.
- d) Transient voltage surge counter.

- G. Equipment Mounting

- a) Switchboard & Distribution Panel TVSS – The TVSS device shall include an integral disconnect switch which has been tested to the surge current rating of the TVSS and match or exceed the fault current rating of the board per NEC 285. The Disconnect shall switch the phases and neutral. The TVSS shall be mounted integral to the switchboard.
- b) Branch panel TVSS – The TVSS device shall be direct bus to bus connected or wall mounted. Use of a breaker to feed an integral device shall not be acceptable.

2.5 ELECTRIC SERVICE STUDIES

A. Standard: Submit studies in accordance with ANSI/IEEE Standard 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

B. Submit one-line diagram for each electrical service. Key all equipment and components on diagram to items in the studies.

C. Provide a short-circuit current analysis for each main panelboard. Short-circuit analysis shall calculate short-circuit levels at service transformer secondary, panelboard main breaker, each feeder breaker and all levels of downstream distribution equipment. Assume infinite source bus.

D. Provide a time-current coordination study for each main panelboard. Coordination study shall compare the operating levels and times of the protective devices to the withstand levels and times that the equipment can sustain without damage or failure. Determine electronic trip unit settings necessary to achieve optimal selective coordination between 480-volt main service circuit breaker and first level of feeder distribution devices. Determine setting for all adjustments of trip units of all electronic circuit breakers that are linked by zone-selective interlocking. Furnish time-current curves for the two (or more) levels of distribution protected with electronic trips, plus the first additional distribution level served from the panelboard feeder. Show a separate composite plot for each feeder breaker trip rating with the main breaker. Plot composite time-current curves on log-log background. Add a typical frame size of downstream molded-case circuit breaker to each panelboard feeder composite plot.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Do not purchase panelboards or cabinets Shop Drawings have been approved.
- B. Circuit numbering and phase connections shall be in accordance with following.
 - 1. In lighting and appliance branch panelboards having two vertical columns of devices, circuit numbering shall be such that, starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side.
 - 2. See schedule of panelboards on Drawings for circuit device sizes and number of poles.

3.2 ELECTRICAL CONNECTIONS

- A. The contractor shall insure the temperature rating associated with the ampacity of a conductor shall be so selected and coordinated as to not exceed the lowest temperature rating of any connected termination, conductor or device as further described in NEC Article 110-14,C (2000 volt and below) and 110-40 (2001-35,000 volt).

END OF SECTION 26 16 40

SECTION 26 32 50 – DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 SCOPE

- A. The intent of this Specification is to cover two-winding dry-type distribution transformers for non-linear loads, single and three phase, primary and secondary voltages of 600 volts and less, and capacity ratings of 15kVA through 1000kVA at the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana.**

1.2 RELATED SECTIONS

- A. Section 26 01 00: General Provision – Electrical
- B. Section 26 03 00: Testing
- C. Section 26 10 00: Basic Material and Methods

1.3 REFERENCES

- A. All transformers herein specified shall be manufactured and tested in accordance with all applicable sections of the latest listed Standards and Publications.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 – National Electric Code

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA ST20 – Dry Type Transformer for General Application

UNDERWRITERS LABORATORIES (UL)

- B. It shall be the Contractor's responsibility to be (or to become) knowledgeable of the requirements of these Standards and Publications.

1.4 SUBMITTALS

- A. Suppliers asking consideration, as an approved equal shall submit complete, warranted performance data and physical dimensions for similar transformers. Data shall be submitted for each size specified.
- B. Follow General and Supplementary Provisions Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Transformers shall be Sorgal Square D Cat No. T3HNV series, Eaton N48 series or General Electric Cat No. TENV series or prior approved equal.

2.2 RATINGS INFORMATION

- A. All insulating materials are to exceed NEMA ST20 standards and be rated for 220° C UL component recognized insulation system.
- B. Neither the primary nor the secondary temperature shall exceed 220° C at any point in the coils while carrying their full rating of non-sinusoidal load. Transformers are to be UL listed and labeled for minimum K13 as defined as the sum of fundamental and harmonic $I_h(\text{pu})^2 h^2$ per UL 1561. Transformers evaluated by the UL K-Factor evaluation shall be listed for 115° C average temperature rise. K-Factor listed transformers rated at 150° C rise shall not be acceptable.
- C. K-Factor rated transformers shall have an impedance range of 3% to 5%, and shall have a minimum reactance of 2% in order to help reduce neutral current when supplying loads with large amounts of third harmonic current.
- D. Transformers 15 KVA and larger shall have a minimum of 6 - 2.5% full capacity primary taps for 480 V primaries and a minimum of 2 - 5% full capacity taps for 208 V primaries. Exact voltages shall be as designated on the plans.
- E. The maximum temperature of the top of the enclosure shall not exceed 50° C rise above a 40° C ambient.
- F. The transformer(s) shall be rated as indicated in the following schedule:
 - 1. Identification Number(s)
 - 2. KVA Rating
 - 3. Voltages
 - 4. Phase
 - 5. Frequency
 - 6. Temperature Rise
 - 7. K-Factor

2.3 CONSTRUCTION

- A. Transformer coils shall be of the continuous wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.

- B. All cores shall be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point to prevent core overheating. The core laminations shall be clamped together with steel angles. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices shall not be acceptable.
- C. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
- D. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.
- E. Transformers shall be supplied with quality, full width electrostatic shields resulting in a maximum effective coupling capacitance between primary and secondary of 33 picofarads. With transformers connected under normal, loaded operating conditions, the attenuation of line noise and transients shall equal or exceed the following limits:
 - 1. Common Mode: 0 to 1.5k Hz - 120 dB; 1.5k Hz to 10k Hz - 90 dB; 10k Hz to 100k Hz - 65 dB; 100k Hz to 1M Hz - 40 dB.
 - 2. Transverse Mode: 1.5k Hz to 10k Hz - 52 dB; 10k Hz to 100k Hz - 30 dB; 100k Hz to 1M Hz - 30 dB.
- F. Sound levels shall be warranted by the manufacturer not to exceed the following:
 - 1. K-4 rating: 15 to 50 kVA - 45 dB; 51 to 150 kVA - 50 dB; 151 to 300 kVA - 55 dB; 301 to 500 kVA - 60 dB; 501 to 700 kVA - 62 dB; 701 to 1000 kVA - 64 dB.
 - 2. K-13 rating: 15 to 50 kVA - 42 dB; 51 to 150 kVA - 47 dB; 151 to 300 kVA - 52 dB; 301 to 500 kVA - 57 dB; 501 to 700 kVA - 69 dB; 701 to 1000 kVA - 61 dB.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Do not purchase Dry Transformers until Shop Drawings are approved.

- B. All transformers shall be suspended above concealed assessable ceilings in finished areas and suspended a minimum of 7' – 0" AFF to bottom of support in areas without ceilings.
- C. Provide supports as shown modified or required to suit conditions.
- D. Final location of transformers shall be subject to designer's approval.

3.2 ELECTRICAL CONNECTION

- A. The Contractor shall insure the temperature rating associated with the ampacity of a conductor shall be so selected and coordinated as to not exceed the lowest temperature rating of any connected termination conductor or device as further described in NEC Article 110-14, C (2000 volt and below) and 110-40 (2001-35,000 volt).

END OF SECTION 26 32 50

SECTION 26 45 00 - GROUNDING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. This work includes the grounding system for the following items for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana.**
 - 1. Electrical
 - 2. Telephone
 - 3. CCTV
 - 4. Data
 - 5. Security
 - 6. Structure (water mains, building steel, rebar, etc.)

1.2 STANDARDS

- A. The grounding system installation shall comply with the National Electrical Code.
- B. Where a referred standard is indicated, the applicable standard shall be made a part of the specifications which refers to it to the same extent as if written out in the specification in full.
- C. Deviations from this standard shall only be permitted with the approval of the Designer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Buried main grounding cables or loops where shown shall clear footings by at least 2'-0" and shall be run 1'-6" minimum below finished grade, except under roads where ground cable or loops shall be buried at least 3'-6" below top of road.
- B. Exposed bare ground cables shall follow, and be securely supported to, the building construction surface contours to avoid mechanical injury.
- C. Ground rods shall clear footings by a minimum of 3'-0" with adjacent rods spaced a minimum of 6'-0" apart or as specified. Top of ground rods shall be 1'-0" minimum below finished grade. Ground cable runs and ground rods shall be located as indicated on Drawings.

- D. All service equipment such as temporary building frames, motor frames, wire mesh enclosures, metallic fences, large steel structures, starter frames, conduit, metal instruments, control, lighting or power panels and/or cabinets, etc., shall be securely and effectively grounded whether shown on Drawings or not.
- E. Grounding wire or cable runs shall be as short and as straight as possible between points of connection to equipment and to ground bus, cable or rods.
- F. Where grounding wires or cables rise through earth and/or concrete floor to electrical equipment, columns, etc., the wires or cables shall be protected by the use of non-ferrous conduit, or PVC conduit, as shown on the Drawings.
- G. Motors grounded by separate wiring to their controllers shall have grounding wire sized in accordance with the National Electrical Code.
- H. Grounding wires for main service protective devices shall be sized in accordance with their ampere rating as shown in the National Electrical Code and shall be green insulated conductors. See Drawings for details.
- I. Main service equipment, conduit work, motors, panelboards, and other electrical equipment shall be effectively and permanently grounded to the cold-water mains as a supplement to ground rods, loop and building steel, or as required by NEC and local codes. Grounding connections and conductor sizes shall be in accordance with requirements of the National Electrical Code Article 250.
- J. Where the continuity of the metallic conduit system is interrupted by a run of nonmetallic conduit, a separate grounding conductor (sized in accordance with NEC Table 250-95) shall be run in the conduit with the circuit conductors. The grounding conductor shall be insulated copper; and shall be finished to show a green color. Provide a grounding conductor where indicated on Plans.

2.2 GROUND RESISTANCE

- A. Ground Resistance shall in no case exceed the value specified under Grounding Tests.
- B. In the event that test readings give higher resistance values than the maximum specified, the resistance shall be lowered by one, or both, of the following methods:
- C. Sufficient additional ground rods shall be driven where required and interconnected by means of the specified bare stranded cable to existing grounds.
- D. Chemical treatment of the soil with magnesium or copper sulfate (90# minimum quality) placed in a trench around the ground rod. Dimensions of the trench shall be approximately 1'-6" I.D. by 3'-6" O.D. and 1'-6" in depth measured from the top of ground rod.

- E. Subsurface metallic water piping may be used as a supplementary ground provided such piping is electrically continuous and electrically conductive to earth and/or is connected to equipment in direct contact with earth such as a well casing, etc. Grounding to water piping alone will not be accepted.

2.3 GROUNDING TESTS

- A. Each ground strap shall be tested for proper grounding by applying a Biddle Ground Tester or equivalent instrument and using auxiliary ground rods. The resistance reading on any strap shall not exceed 1.0 ohms.
- B. On new installations, all underground connections in the ground grid shall be given a visual inspection.
- C. Equipment grounds shall show a resistance of 0.5 ohms or less to the ground grid or ground bus.

PART 3 - EXECUTION

3.1 CONNECTIONS

- A. All grounding shall be thermal welded connections unless shown otherwise.
- B. All grounding connections shall be made between clean bare metal surfaces free from paint, corrosion, grease, oil, insulation or similar nonconductive coatings and as follows:
- C. Copper to copper - use wire brush. No flux.
- D. Copper to galvanized steel - use wire brush. No flux but replace zinc with galvanizing bar.
- E. Copper to aluminum - use wire brush. Tin copper with 100 percent pure tin (not solder). Apply flux to aluminum.

3.2 WIRING SYSTEMS

- A. Metal enclosures for wire and cable such as conduits, cable trays, and raceways shall be grounded at their supply ends.
- B. Connections shall be made to the switchgear or control center ground busses when such equipment is used.
- C. The electrical continuity of metal enclosures for wire and cable shall be assured between terminations.

3.3 EQUIPMENT

- A. As used herein, the term "equipment" applies to all electrical distribution, control and utilization components and includes such items as transformers, panelboards, lighting fixtures, receptacles, switching devices, and motors.
- B. Metal enclosures of fixed equipment operating at 600 volts or less between conductors and supplied from ungrounded or high resistance grounded systems shall be grounded.
- C. Metal enclosures of fixed equipment operating at 600 volts or less between conductors and supplied from solidly grounded or low resistance grounded systems are considered grounded through their ground return path and do not require further grounding.
- D. Metal enclosures of portable equipment shall be connected to a grounding conductor located within the same cable assembly as the line conductors supplying the equipment. Grounding conductor shall be the same size as the line conductor. The grounding conductor shall be connected to the receptacle enclosure through separate contacts in the supply plug and receptacle and shall be bonded to the plug enclosure. Plug and receptacle shall be polarized and arranged so that the ground connection makes first and breaks last.

3.4 GROUND RETURN PATHS

- A. For solidly grounded and low resistance grounded systems, a metal ground return path shall be provided for each circuit supplying fixed equipment.
- B. The return path shall be connected to the equipment metal enclosure at one end and to the system or system neutral ground at the other end.
- C. A separate, green insulated, equipment grounding conductor shall be provided in each conduit run.

END OF SECTION 26 45 00

SECTION 26 50 00 - LIGHTING

PART 1 - GENERAL

1.1 LIGHTING SCHEDULE

- A. The Contractor shall install lighting fixtures and accessories as shown on the drawings and/or described herein. The Contractor shall also install lamps for all fixtures.

1.2 SCOPE

- A. This work includes indoor and outdoor lighting fixtures and related items for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana.**

1.3 RELATED WORK

- A. SECTION 26 01 00: General Provisions Electrical
- B. SECTION 26 10 00: Basic Material and Methods

1.4 SUBMITTALS

- A. Submit shop drawings under provisions of Section 26 01 00.
- B. Submit Operations and Maintenance data under provisions of Section 26 01 00.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 26 01 00.
- B. Store and protect products under provisions of Section 26 01 00.

PART 2 - PRODUCTS

2.1 LED Drivers

- A. Fixtures shall be provided with long-life LEDs coupled with high -efficiency drivers.
- B. Drivers shall provide the quality of illumination for extended service life.
- C. LED drivers shall provide a minimum of 80% LED lumen maintenance at 60,000 hours.
- D. All lighting fixture LED drivers shall be provided with dimming capability.
- E. All LED drivers shall be U.L. Listed.

2.4 FIXTURES

- A. Fixtures as described in the Fixture Schedule on the drawings shall be furnished by the Contractor and shall be properly installed.

2.5 WARRANTY

- A. All LED type lighting fixtures shall be provided with a minimum five (5) year manufacturer and installer warranty for interior lighting fixtures and a minimum seven(7) manufacturer and installer warranty for exterior lighting fixtures as described further herein. Warranty shall cover the entire fixture including, but not limited to the lens, housing, LED arrays, the LED drivers and integral control devices to be free from defect in material and workmanship for a period of five (5) years for interior fixtures and seven (7) years for exterior fixtures. Warranty shall begin on the date of Substantial Completion of the project. The LED arrays in the lighting fixture shall be considered defective in material or workmanship if a total of 15% or more of the individual light emitting diodes in the lighting fixture fail to illuminate. The lighting fixture warranty does not apply to failure of the lighting fixture as a result of external causes, including, but not limited to, physical damage, exposure to adverse or hazardous chemical or other substances, environmental conditions, vandalism, power fluctuations, animal, insect activity, negligence, etc. If any lighting fixture is found to be defective, the lighting fixture shall be either repaired or replaced with a duplicate or functionally equivalent new fixture. All warranty repair or replacement shall be completed at no cost to the Owner.

2.6 OCCUPANCY SENSORS

- A. Sensor shall be a self-contained ceiling or wall mounted device capable of directly switching loads upon detection of human activity. Sensor shall be circular, and mount to either a single gang enclosure, or surface mount to a round pancake box as necessary for the application.
- B. Ceiling heights and rooms sizes vary throughout the project. It shall be the Contractor's responsibility to provide the appropriate occupancy sensor and all accessories for the application to ensure reliable operation.
- C. Sensor shall be rated for the lighting branch circuit voltage/load and shall be capable of switching electronic ballast loads. Sensors shall be capable of parallel wiring for multi-sensor applications. Sensors shall be provided with additional relays or "power packs" and all other necessary appurtenances properly sized for the application to control the lighting loads in each space this project.
- D. Sensor time delay shall be factory set for typical applications, and field adjustable from 30 seconds to 20 minutes. Sensor shall provide a green LED motion indicator. Red LED denoting life safety shall not be permitted.
- E. PIR sensing shall utilize a high-density Fresnel domed lens, providing a circular view pattern of at least 360 degrees by 56 degrees.

- F. Occupancy sensors shall be compatible with the overhead projector system and smart board systems and shall not cause interference of any kind.
- G. Passive Dual Technology (PDT) sensing shall incorporate PIR with Microphonics, and shall utilize a passive microphone with automatic gain control (AGC) to sense both occupants moving and sounds. The PIR shall be used to initiate an on condition, once on the PIR or Microphonics shall keep the load on. After the time delay expires and the load goes off, the Microphonics shall remain active up to 10 seconds as a back-up grace period.
- H. Occupancy sensor shall be Sensor Switch Model # CMR Series (line voltage sensors) or Model #CM Series (low voltage sensors) with Model #PP (power packs) as required for the application, or approved equal. At the Contractor's option, line voltage or low voltage occupancy sensors can be utilized based on the branch circuit loading, however all switching in each space shall be performed with line voltage lighting switches. The occupancy sensor shall only control the lighting branch circuit in each room and shall not be interconnected to the lighting control panel, unless shown otherwise.
- I. Wall mounted occupancy sensors shall be Sensor Switch WVR PDT series suitable for the application. Provide separate lighting contactors controlled by the occupancy sensor if the lighting load exceeds the line voltage occupancy sensor capacity.

PART 3- EXECUTION

3.1 INSTALLATION

- A. Unless otherwise specified, lighting fixtures shall be permanently installed and connected to the wiring system.
- B. The Contractor shall support each fixture, independently from the building structure. Ceiling framing members shall not be used to support fixtures except in specified areas where ceiling supports for this purpose have been specified elsewhere in these specifications. Each fixture shall have at least two fixture supports.
- C. Flexible conduit used for fixture whips shall be at least twelve (12) inches, but not more than 72 inches long.

3.2 CEILING COMPATIBILITY

- A. Catalog numbers shown on the drawings or descriptions of lighting fixtures contained herein may indicate fixture compatibility with certain types of ceiling construction. Contractor shall determine exact type of ceiling actually to be furnished in each area and shall obtain fixtures to suit, deviation from specified catalogue numbers or descriptions only where necessary and only to the extent necessary to insure fixture/ceiling compatibility.

3.3 LIGHT LEAKS

- A. The Contractor shall, at the end of this project, adjust all recessed lighting fixtures so that there will be no light leaks between the fixture trim and the ceiling. Contractor shall also adjust recessed fluorescent fixtures to eliminate any light leaks between fixture trim and ceiling grid member.

3.4 EXIT FIXTURES

- A. Exit fixtures shall be installed according to Life Safety Code requirements, with face(s) plainly visible and directional arrows indicating the proper direction of egress.

END OF SECTION 26 50 00

DIVISION 27
COMMUNICATIONS

SECTION 27 70 00 - SPECIAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish and install special systems and accessories as shown on the drawings and/or described herein.
- B. Shop drawings shall be submitted for approval and shall include complete catalog data and other data shown to describe the equipment proposed. See individual Specification Sections for specifics on required submittal data.

1.2 COMMUNICATIONS SYSTEMS

- A. Special systems specifications listed in Part 2 of this specifications may be found in other specification sections as described herein. The individual specification sections shall be referenced for complete product descriptions.

PART 2 – PRODUCTS

2.1 SECURITY SYSTEM

- A. Refer to Specification Section 26 98 00 for description of the security system requirements.

2.2 FIRE ALARM SYSTEM

- A. Refer to Specification Section 26 71 00 for description of the Fire Alarm System requirements.

2.3 CLOSED CIRCUIT TV

- A. Refer to Specification Section 26 74 00 for description of the infrastructure needed for the connection of WBR SB provided cameras.

2.4 DATA & TELEPHONE PLANT

- A. Data and Telephone Plant shall be provided this project as shown.

2.5 INTERCOM SYSTEM

- A. Intercom System shall be provided and installed by the WBR SB. Provide infrastructure as required for its installation.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Unless otherwise specified, all special systems shall be permanently installed and connected to the wiring system. The systems shall be installed according to manufacturer standards and recommendations.
- B. The Contractor shall properly support each device, independently from the building structure. Ceiling framing members shall be used to support devices except for devices specifically intended for such installation.
- C. A factory-trained technician shall install the special system equipment. Coordination with the Architect and Owner shall be important for proper positioning of all special systems equipment.
- D. Contractor shall be aware, at the end of the one-year warranty period, all Dealer codes, including but not limited to downloading code, master code, installer code, etc. shall be returned to the factory default settings, in an effort to allow APSS to manage all of their special system equipment.

3.2 CONDUIT AND WIRING

- A. All wiring for special systems shall be installed in conduit or surface raceway as applicable. All wiring shall be new and shall be as specifically recommended by the Special Systems manufacturer and shall not be smaller than sizes shown on the Drawings.
- B. Special systems wiring not installed in conduits shall be supported from j-hooks. Wiring shall be bundled using Velcro straps and neatly tied using Velcro straps to support hooks. Special system wiring shall not be power wiring. Voice and data system wiring shall not be mixed with wiring for other systems. Fire alarm system wiring shall be red and routed independently from other systems. Data system wiring solutions (copper and fiber) shall be routed independently from other systems.

END OF SECTION 26 70 00

SECTION 27 71 00 – FIRE ALARM AND DETECTION SYSTEM

A. General Requirements

1. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.
2. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.
3. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as UL or ETL and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under the direction of a qualified and factory approved distributor, to the approval of the owner.
4. Provide a CAT6 (red) cable from the Fire Alarm Control panel to the nearest network rack. The cable shall be terminated in closest patch panel and labeled as Fire Alarm.

B. Scope of Work

1. This specification describes a Fire Detection and Alarm system for the **Cohn Elementary School, Additions & Renovations, Port Allen, Louisiana**. The control panel shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards.
2. The features and capacities described in this specification are required as a minimum for this project and shall be furnished and installed by the Fire Alarm Contractor.
3. Fire alarm system to be interfaced to the existing Open Graphics Navigator Central Monitoring System (CMS) located at the West Baton Rouge Parish School Board Operations Center.
4. On completion of the installation, the system shall be tested for proper operation and issue an inspection certificate in accordance with NFPA-72.
5. The complete installation shall conform to the applicable sections of NFPA and the Louisiana State Fire Marshal

C. Related Work:

The following Sections of the Specifications shall apply to this work:

Division 1 Bidding Requirements and Conditions of the Contract.
Division 26 Section 26 10 00 Electrical Material & Methods.

D. Standards & Codes:

1. The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version

of each listed publication shall be used as a guide unless the Authority Having Jurisdiction has adopted an earlier version.

2. National Fire Protection Association (NFPA) Most current or approved Standard
 - a) NFPA 13 Standard for The Installation of Sprinkler Systems.
 - b) NFPA 13A Recommended Practice for The Inspection, Testing And Maintenance of Sprinkler Systems.
 - c) NFPA 70 National Electrical Code.
 - d) NFPA 72 National Fire Alarm Code.
 - e) NFPA 90A Standard for The Installation of Air Conditioning And Ventilating Systems.
 - f) NFPA 101 Life Safety Code.
3. Underwriters' Laboratories, Inc. (UL) Appropriate "UL" equipment standards.
 - a) "UL" 864 Control Panels.
 - b) "UL" 268 Smoke Detectors.
 - c) "UL" 268A Smoke Detectors (HVAC).
 - d) "UL" 464 Audible Signal Appliances.
 - e) "UL" 1971, Standard for Visual Signaling Appliances.
4. Building Codes
 - a) Standard Building Code and the Standard Fire Code.
 - b) Uniform Building Code and the Uniform Fire Code.
 - c) International Building Code and the International Fire Code.
 - d) NFPA 5000 Building Code.
 - e) State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction.
 - f) ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.

E. Qualifications of Installers

1. Before commencing work, submit data showing that the contractor has successfully installed fire alarm systems of the same scope, type and design as specified. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least 10 years and located not more than 75 miles from any facility involved in this project. The contractor shall be a fully authorized distributor of the equipment supplied with full

manufacturer's warranty privileges. Use of a subcontractor to perform any part of the installation, programming or testing does not meet the intent of this specification.

2. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction. Project Manager for this system shall hold a NICET Level III certification. All technicians and installers involved in the installation shall hold a NICET Level II certification. All employees of the firm shall hold a license issued by the Louisiana Office of the State Fire Marshal as a Fire Alarm endorsement.
3. The Fire Alarm Contractor shall be factory trained and certified by the system manufacturer and experienced in the installation and operation of the system provided. The Contractor shall be a stocking distributor with an inventory of stock on hand to replace any warranty parts when requested. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The installing company shall be an authorized distributor or dealer with trained installers and technicians.
4. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.
5. Installation of the system shall be performed by the Fire Alarm Technician. The Fire Alarm Technician shall be certified as a minimum of a NICET Level II. The installation of wiring and/or end devices by the electrical contractor will not be accepted.
6. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and a minimum of 20 years of experience in the industry. The supply contractor shall have attended the manufacturer's installation and service school. A certificate for this training shall be provided with the contractor's submittal.

F. Submittals

1. The contractor shall include the following information in the equipment submittals:
 - a) Battery power and capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement.
 - b) Supervisory power requirements for all equipment.
 - c) Alarm power requirements for all equipment.
 - d) Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.
 - e) Voltage drop calculations for Notification circuit wiring runs demonstrating worst case condition.
 - f) NAC circuit design shall incorporate a 15% spare capacity for future expansion.

- g) Submit manufacturer's requirements for testing Device Loop Card circuits and device addresses prior to connecting to control panel.
- h) Complete manufacturers catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.
- i) Complete drawings covering the following shall be submitted by the contractor for the proposed system:
 - i. Floor plans in a CAD compatible format showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code used.
 - ii. Provide a fire alarm system function matrix as referenced by NFPA 72. Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all exclusions, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.
 - iii. Point to point riser diagram showing all devices, circuits, addresses, interfaces to other equipment, wire type, and size.
- j) Contractor shall provide all documents required by the State Fire Marshal to review. Documents shall include all calculations and data necessary. These documents shall be approved by the Professional of Record prior to submission to the State Fire Marshal. This Contractor shall pay all fees associated with the Fire Marshal submittal. No work shall be done until the submittal is approved and returned from the Fire Marshal.

G. Service and Maintenance

- 1. Provide data to be incorporated into the maintenance manual specified herein and including the following:
 - a) Operation and maintenance instructions for the complete Fire Alarm system to permit its effective operation and maintenance.
 - b) Technical data, installation and maintenance instruction and illustrated parts list with part numbers.
 - c) As-built drawing indicating final wiring paths, end-of-line locations, modifications made in the field during the course of construction, electrical circuit identifications and a device list.
- 2. Installer shall provide a one-year limited warranty on installed Fire Alarm system including a full system inspection on all installed equipment prior to the end of the warranty period.

PRODUCTS

A. Acceptable Manufacturers

1. Mircom Technologies, LTD. FX-2000 FlexNet, Edwards or prior approved equal

B. System Requirements

1. The system shall be a complete, electrically supervised fire detection and notification system, microprocessor-based operating system having the following minimum capabilities, features and capacities:
 - a) Single addressable loop expandable to 5 addressable loops
 - b) 1,590 addressable initiation device capability.
 - c) Addressable devices shall operate on "standard wire" no special twist or shield shall be required.
 - d) 4 notification circuits capable of Style Y (Class B).
 - e) Optional relays or LED drivers for graphic annunciation.
 - f) Optional Remote annunciator/control panel.
 - g) Optional DACT capable of sending point information to a Remote Station compatible with the Central Station.
 - h) 80-character backlit LCD display with 40-character Customer defined message.
 - i) Be programmable from system keypad or Laptop computer.

C. System Operation

1. Activation of any manual pull station, heat detector, smoke detector, or sprinkler water flow device, the Fire Panel shall:
 - a) Cause the alarm audible and visual signaling devices to sound throughout the facility until silenced. The audible signal appliances shall continue to sound during alarm conditions until manually or automatically silenced.
 - b) Activate the digital communicator to notify the Remote monitoring station and local fire department.
 - c) Cause auxiliary contacts to activate door release, shut down fans, elevator recall, etc., as applicable.
 - d) A pulsing alarm signal tone shall occur within the control panel and annunciator(s).
 - e) Turn on the respective red alarm LED at the control panel and annunciator panels as shown on the plans.

- f) Display the activated device on the LCD display at the main Fire Alarm control panel and all fire alarm remote annunciator panels.
 - g) A subsequent alarm shall reactivate signals if a different device causes an alarm after they have been manually silenced.
2. Activation of any supervised valve closure switch, air pressure abnormal switch, low temperature switch, sprinkler tamper valve, or duct detector, the Fire Panel shall:
- a) Activate the digital communicator to notify the Remote monitoring station and local fire department.
 - b) Cause auxiliary contacts to activate door release, shut down fans, elevator recall, etc., as applicable.
 - c) A pulsing alarm signal tone shall occur within the control panel and annunciator(s).
 - d) Turn on the respective orange supervisory LED at the control panel and annunciator panels as shown on the plans.
 - e) Display the activated device on the LCD display at the main Fire Alarm control panel and all fire alarm remote annunciator panels.
3. A system trouble shall:
- a) Activate the digital communicator to notify the Remote monitoring station and local fire department.
 - b) Cause auxiliary contacts to activate door release, shut down fans, elevator recall, etc., as applicable.
 - c) A pulsing alarm signal tone shall occur within the control panel and annunciator(s).
 - d) Turn on the respective yellow trouble LED at the control panel and annunciator panels as shown on the plans.
 - e) Display the activated device on the LCD display at the main Fire Alarm control panel and all fire alarm remote annunciator panels.
 - f) Describe the nature of the trouble on the panel's LCD display. The following conditions shall be monitored:
 - i. Open circuit fault in the field wiring of an addressable loop, addressable detection or signal module, or a short on an addressable loop or signal circuit
 - ii. Failure of a supervised indicator on the remote annunciator or open or short on the wiring to the annunciator
 - iii. Disconnection or failure of the battery pack
 - iv. A ground fault condition on a field wire
 - v. Failure of the main 120VAC power supplied to the panel.

- vi. Removal or malfunction of any addressable field device or any required panel module or component.
- vii. The panel and remote annunciator shall be silenced by operation of the Trouble switch. The trouble conditions shall clear from the panel when the cause is rectified.

D. Control Switches

- 1. System Reset Switch shall clear the panel of alarm or supervisory conditions once the field device is restored. Also, shall perform lamp test function.
- 2. Signal Silence switch shall silence the audible/visual signals during the alarm condition.
- 3. Acknowledge Switch silences panel alarm and remote annunciator.
- 4. Fire Drill Switch for testing of Fire Alarm signaling appliances.
- 5. Lamp Test Switch shall perform lamp test function of all indicator LED's automatically on panel.

E. Additional System Parameters

- 1. The system shall contain a two-history log of events; one for alarm related events and one for all other events. The operator may view at any time. The Previous Event and Next Event controls on the panel shall be used to view the events currently showing on the panel LCD display.
- 2. RS-232 port for remote system printer or "CRT".
- 3. The system shall contain four status queues with selector switches and LEDs for alarm, supervisory, trouble, and monitor. It shall also group bypass with built-in false alarm prevention technology. Two event history logs comprised of a 6000-event alarm history log for alarm related events and a 6000-event log for all events shall be provided. A built-in one man walk test operation, BACnet support, and built-in ethernet port shall be provided. System shall have up to 63 nodes and a peer-to-peer network communications. An arcnet network communications protocol and supports copper and/or fiber optic network cable shall be provided.

F. Supervision

- 1. The alarm activation of any device shall not prevent the subsequent alarm operation of any other device.
- 2. There shall be up to 4 (four) independently supervised and independently fused indicating appliance circuits for alarm indication.

3. All auxiliary manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system trouble.
4. Each independently supervised circuit shall include a discrete LCD "Trouble" message to indicate disarrangement conditions per circuit.
5. The incoming power to the system shall be supervised so that any power failure shall be audibly and visually indicated at the control panel. A green "power on" LED shall be displayed continuously while incoming power is present.
6. The system batteries shall be supervised so that disconnection of a battery shall be audibly and visually indicated at the control panel. A Depleted Battery message shall indicate when standby operation has exceeded battery capacity.
7. The System Expansion Modules connected by ribbon cables shall be supervised for module placement. Should a module become disconnected from the CPU the system trouble indicator shall illuminate and audible trouble signal shall sound.

G. Power Requirements

1. The control panel shall receive 120 VAC power via a dedicated circuit. The disconnect switch shall be identified in red. Location of the disconnect shall be permanently affixed to the Fire Alarm Control Panel, Evac Panel, and All Remote signal power supplies.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a full load mode for a minimum of twenty-four (24) hours with at least thirty (15) minutes of alarm indication at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70% capacity in 12 hours.
3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control panel.

H. Networkable Fire Alarm Control Panel

1. System Control Unit – Mircom FX-2000 FlexNet, Edwards or prior approved equal.
2. The control unit shall contain the microprocessor system operating software and non-volatile programmed memory. The unit shall be used to process all system information. In addition, shall contain four (4) standard audible/visual signal circuits with option to add signals explain herein. The panel shall also have, alarm, trouble, and supervisory contacts.
3. The system control shall contain one (1) analog loop base, with expansion up to five (5) analog/addressable loops. Loop shall be connected in a Class A or B Style configuration. Loop wiring shall be via a 16ga. Min. twisted, unshielded pair to be determined by the following: Max. 40 ohms loop resistance and Max of 0.5uf

capacitance. Each loop shall be capable of communicating with up to 159 addressable sensor devices and 159 monitor output devices (318 points per loop)

- a) Store all system functionally and job specific data in non-volatile memory. System is to survive a complete power failure intact.
 - b) System control unit shall be capable of supporting up to sixteen (16) conventional hardwired adder modules (any combination of signal. Detection or relay modules) and/or four (4) additional analog loops.
 - c) Provide an LCD Display Module of membrane style construction with a 4 line by 20 characters Liquid Crystal Display. Use super twist LCD technology and backlighting for high contrast visual clarity. In normal mode display the time, date, system condition and facility name.
 - d) Provide visual indicators for the following common control functions: AC Power, alarm, supervisory, monitor, trouble, bypass and ground fault. Provide common control keys and visual indicators for reset, alarm, signal silence, trouble silence, and two custom programmable key/indicators.
4. The system shall be designed for peer-to-peer network communications and capable of a maximum of 63 nodes. The network configuration allows the control panel to be connected to the network to provide additional input circuits, visual zones, programmable notification appliances circuits and relays. The network interface module allows the panels to communicate on a peer-to-peer network via an Arcnet Network Communications protocol.

I. Expansion Modules

1. Loop Expansion Module

- a) The Quad Loop Controller Module provides two Signaling Line Circuits (SLC) to the system consisting of 99 Analog Sensors and 99 Addressable Modules per loop for a total of 396 analog/addressable points.
- b) The Daughter Board provides an additional two Signaling Line Circuits (SLC) to the system consisting of 99 Analog Sensors and 99 Addressable Modules per loop for a total of 396 analog/addressable points when connected to the Quad Loop Controller Module. The daughter board mounts on top of the Quad Loop Controller Module.
- c) Analog loops can be wired in a Class A (Style 6 or 7) or Class B (Style 4) configuration.

2. Hardwire Controller Expansion Module. The Hardwire controller module allows support of an additional sixteen (16) conventional hardwired adder modules.

- a) Zone Initiating Circuit Module, provides Eight (8) Class B (Style B) or 4 Class A (Style D) initiating circuits configurable for alarm, supervisory or trouble zones. The zone module shall occupy one module slot in the control panel. The circuits shall be

- power limited for use with FPL, FPLR, or FPLP power limited cable, and shall be capable of being individually disconnected via dip switches.
- b) Indicating Circuit Module shall provide four (4) Class A or B (Style Z or Y) indicating circuits configurable as Silenceable or Non-silenceable. Each indicating Circuit is to be capable of 1.7amps power limited supply. The indicating circuit module occupies one module slot in the control panel. The circuits shall be power limited for use with FPL, FPLR, or FPLP power limited cable, and shall be capable of being individually disconnected via dip switches.
 - c) Eight Relay Circuit Module provides eight (8) individual configurable relays per module. Each relay provides one Form C contact rated at 28VDC @ 1amp (resistive load) as well as a Green LED to indicate that the relay is active. The relay module occupies one module slot in the control panel. The contacts shall be power limited for use with FPL, FPLR, or FPLP power limited cable, and shall be capable of being individually disconnected via dip- switches.
3. Network Communications Modules
- a) The Fire Network Controller Module provides network capability to the panels. One fire network controller module is required per network node panel. In addition, the module provides an interface for adding an optional Fiber Optic Network Adder Module
 - b) The Fiber Optic Network Adder Module allows for the use of fiber optic cabling on the panels.

J. Fire Alarm Central Management

- 1. Panel shall be equipped with an Ethernet jack for interface to the school districts network infrastructure to communicate with the Open Graphics Navigator Central Monitoring System.
- 2. Contractor to add this site to the existing Open Graphics Navigator Central Monitoring System. Provide graphics file, device locations, licensing, setup, configuration and testing of the Prairieville High School site on the CMS.

K. Digital Communicator

- 1. Digital Communicator shall be provided for dial up /data transmission signal to a remote monitoring agency to signify a system alarm and/or trouble condition. Digital Communicator can be programmed for dual line operation and uses Ademco Contact ID and SIA-DCS Protocols. The Digital Communicator shall report to the monitor station detailed information on the device causing the alarm, trouble, or supervisory signals. The Digital Communicator reports point specific information. **CONTRACTOR SHALL PROVIDE THE FIRST YEAR OF MONITORING AS PART OF THIS CONTRACT.**

L. Cellular Communicator

1. Provide a cellular communicator meeting UL 864 requirements for sole, primary and backup path communications.
2. By being able to signal failures to the central station within sixty minutes of an outage, the cellular communicator should be installed as the sole path for commercial fire installations.
3. Automatic self-tests with central stations notification ensure the cellular system is operating.
4. Available relay output for tripping the alarm control panel when a trouble condition occurs.
5. Provide external antenna mounted on exterior of building. **CONTRACTOR HALL PROVIDE THE FIRST YEAR OF MONITORING AS PART OF THE CONTRACT.**

M. Cabinet

1. The cabinet shall be made of 16 Gauge cold-rolled steel painted red. Trim ring shall be available to provide flush mounting if needed.
2. The cabinet shall have universal lock / key assembly and a removable door.
3. The cabinet shall be capable of accommodating up to 40ah battery pack, without the need for an external battery enclosure.

N. Detection Devices

1. Setting a device shall be by use of rotary dial switches; devices that use electronic addressing or require the use of special programmers shall not be accepted.
2. Addressable pull stations shall be constructed of red finished metal with rotary switches at the back to set the device address. Reset of the station shall be accomplished via key.
3. Addressable heat detectors shall contain a dual thermistor sensing circuit to ensure rapid response and to virtually guarantee activation after the required 15-degree F per minute temperature rise. The detector's sensing area shall permit 50 foot spacing between units in open area applications. The unit shall mount on a standard model addressable device base.
4. Addressable smoke detector uses the photoelectric principle for smoke detection. The unit shall be capable of communicating its status (i.e. alarm, "dirty sensor") and adjust its parameters to meet various environmental conditions. The detector contains the rotary switches for address setting. The unit shall mount on a standard model addressable device base.
5. Addressable Duct smoke detectors shall be **PROVIDED BY THE FIRE ALARM CONTRACTOR AND INSTALLED BY THE MECHANICAL CONTRACTOR** and contain an integral relay to perform local fan control.

6. Addressable Monitor module shall provide for connection to sprinkler system and hood suppression system provide under the mechanical section.
7. On the address loop, the fault indicator shall provide isolation of short-circuited sections of the address loop, preventing the entire loop from becoming inoperable and allowing address devices and modules in the non-shorted sections to continue to function properly. Fault indicator module shall be provided for every 20 addressable devices and at least one for each wing and floor of the building.

O. Emergency Voice Evacuation System

1. The Voice Evacuation Alarm System shall be compatible with any UL Listed Fire Alarm Control Panel (FACP) that complies with Life Safety Codes (NFPA 101) and standards (NFPA 70 & 72).
 - a) The Emergency Voice Evacuation System can be capable of communicating with the FACP via the SLC communications loop. System shall report the following conditions to the main fire alarm control panel: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Trouble and Amplifier Fault. The Emergency and Fire Alarm Audio System shall be fully supervised including microphone, amplifier output, speaker wiring, and tone generation.
 - b) The main control board shall distribute and control emergency voice messages over the speaker circuits. System shall be a minimum of 30-Watt, 70 volts audio amplifier. The system shall be capable of expansion to 60 watts total via an optional audio amplifier module into the same cabinet. The Emergency and Fire Alarm Audio System shall allow communicate in any combination of up to five (5) external distributed audio amplifiers each capable of 30 or 60 watts. It shall be the Contractors responsibility to provide the proper amplifier wattage necessary for the application of the various areas of this facility.
 - c) Digital Message with a memory capacity for up to 12 minutes of audio messages in total. The Digital Message shall be capable of producing twelve distinct messages. The software configurator can be used to select default messages; import custom message, record custom message and have Text to Speech capability.
 - d) Designed to meet the NFPA 72 sleeping space requirement to produce a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent. Built in alert tone patterns with March Code, California, Steady, Alert Tone, Temporal, 520HZ, Continuous Whoop, or No Tone is field programmable. Tone Prior to transmitting a message, the Emergency and Fire Alarm Audio System can be programmed to produce a pre-announce and post-announce tone. Repeat Forever Select the number of times the message will be repeated during an alarm. A message can be repeated 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or an *Infinite* number of times.
 - e) The Emergency and Fire Alarm Audio System shall be capable of detecting and Speaker outputs shall be fully power-limited. Amplifiers shall be supplied power independently to eliminate a short on one circuit from affecting other circuits.

P. Remote Signal Power Supply

1. Remote Signal Power Supply capable of communicating with the FACP via the SLC communications loop. System shall report the following conditions to the main fire alarm control panel: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Trouble and circuit Fault. Provide Notification Appliance Circuit expansion support, for additional horns/strobes to allow ADA compliance.
2. It shall also provide 1 AMP auxiliary power to support system accessories.
3. System shall provide a minimum of 10 AMPs of electronically regulated and filtered 24VDC power to Class B or Class A NAC loop circuits.
4. Power Supply shall be provided with eight (5) outputs for powering NAC devices. Outputs to be rated for 2.5 amp max., and can be independently programmed for Steady, Temporal Code 3 or Strobe Synchronization.
5. Power Supply shall have a sync Input/Output for synchronization to and from the fire alarm control panel and other remote signal power supplies.
6. In non-alarm condition independent loop supervision for Class A and/or Class B FACP NAC circuits shall be provided. In the event of a loop trouble, the FACP will be notified and record the trouble condition.
7. The Power supply shall report to the main control panel and common trouble.
8. Power supply shall employ a programmable LCD display interface, plus an ethernet port interface for remote programmability and monitoring.
9. The battery backup shall have a built-in charger for sealed lead acid or gel type batteries.

Q. Notification Appliances

1. Visual Signaling Appliance
 - a) The strobes shall be listed to standard UL 1971 and ADA for fire protective Service. The units shall be selectable 15/75, 30/75, 60/75, 75, and 110 candela ratings and be available for wall or ceiling mount configurations. All versions shall draw the same current on 24Vdc and Full Wave rectified. The 15/75 candela unit shall draw no more than 59ma. Units shall use a Xenon flash tube for reliability and be capable of mounting on 1, 2 gang or standard 4 square electrical boxes. The appliances shall incorporate a Universal Mounting Base that shall allow mounting to a single-gang, double-gang, or 4-inch square back boxes. Removal of an appliance shall result in a supervision fault condition by the Fire Alarm Control Panel (FACP). The mounting base shall be the same base among all horn, strobe, horn strobe, wall, and ceiling models. All notification appliances shall be backwards compatible. The strobes shall not drift out of synchronization at any time during operation.

2. Audible Visual Signaling Appliances

- a) The audible shall have a minimum of three field selectable settings for dBA levels and shall have a choice of continuous or temporal (Code 3) audible outputs. The appliance shall be available for wall or ceiling mount applications. The appliances shall incorporate a Universal Mounting Base that shall allow mounting to a single-gang, double-gang, or 4-inch square back boxes. Removal of an appliance shall result in a supervision fault condition by the Fire Alarm Control Panel (FACP). The mounting base shall be the same base among all horn, strobe, horn strobe, wall, and ceiling models. All notification appliances shall be backwards compatible.
3. The Speaker shall be listed for UL 1971 and ADA and shall be approved for fire protective Service. The Speaker must have the capability of 100dBA @10' when tapped at 2.5 watts. Speakers shall have the capability of being tapped at 1/3, 2/3, 1.5 and 2.5 watts. The appliance shall be available for wall or ceiling mount applications.

R. Annunciator Panel

1. Annunciator Panel shall be backlit alphanumeric display and be provided with directional keypad and switches. The annunciator shall include normal, alarm, trouble and supervisory LED's. Annunciator shall mimic all operations of the Main Control Panel. Ann shall be in a locked enclosure and shall not require the use of a passcode to operate.

S. Wire and Cable

1. Addressable Loop shall be not less than #16 AWG twisted, unshielded cable type FPL, FPLR, or FPLP
2. Signal circuits shall be #14AWG minimum unshielded type FPL, FPLR, or FPLP
3. Speaker circuit shall be #18 AWG minimum twisted shielded pair type FPL, FPLR, or FPLP.
4. In no case will the voltage drop to any signal exceed 10%.

EXECUTION

A. Installation

1. Provide outlet boxes of ample size for clearance to wiring connections; in particular, boxes for manual pull stations with plaster ring.
2. Install all components per manufacturer's recommendations, and coordination with the installation schedule.

3. Installed in J hooks mounted to building structure in accessible ceilings.
4. In mechanical rooms, electrical room and inaccessible ceiling wiring in EMT conduit minimum $\frac{3}{4}$ ".
5. All conduits run underground shall be 1" minimum. Schedule 80 PVC.

B. Wiring

1. Provide all necessary supply interconnecting, and remote signal wiring, in accordance with the manufacturer's wiring diagrams and the requirements of the Electrical Code and the Inspection Authority.
2. Use solid copper conductors and size wiring to Class 2 requirements, but protect from mechanical injury or other conditions such as moisture, excessive heat or corrosive action to Class 1 requirements.

C. Testing and Inspection

1. The manufacturer's representative shall make an inspection of the fire alarm equipment, including those components necessary to the direct operation of the system such as manual stations, thermal and smoke-actuated detectors and controls, whether or not manufactured by the manufacturer. The inspection shall comprise an examination and test of such equipment for the following:
 - a) That the type of equipment installed is that designated by the specifications.
 - b) That all products-of-combustion (smoke) detectors have been properly calibrated and adjustments set correctly.
 - c) That equipment has been installed in accordance with the manufacturer's recommendations and that all alarm-initiating, annunciation and signaling devices have been tested to verify their operation.
 - d) That supervisory wiring of those items of equipment connected to a supervised circuit is operating and that the wiring, having been met to the satisfaction of inspecting officials.
 - e) Testing to be done in the presence of the local Fire Marshal, Electrical Engineer and Owners representative.

D. Verification

1. At the completion of the installation provide two letters of certification one from the electrical sub-contractor and one from the system manufacturer's representative. Each on company letterhead and signed by an authorized officer of the company. Each letter shall indicate the following:

- a) The name of the system
 - b) The name of the facility
 - c) The correct address of the facility
 - d) A statement that the system has been installed and that it operates in accordance with the drawings and specifications and that the system was found to be in proper operating conditions.
 - e) A copy of the final record drawings. See Section G.1.c.
 - f) Provide final Record of completion and Inspection certificate with smoke detector sensitivity readings.
2. This information shall be submitted to Engineer prior to scheduling substantial completion inspections.

END OF SECTION 27 71 00

SECTION 27 74 00 – DATA SYSTEMS

PART 1 – GENERAL

1.1 SCOPE OF WORK FOR COMMUNICATIONS SYSTEM

- A. The Contractor shall furnish labor, materials, and equipment for the installation of a communication system infrastructure to provide the maximum performance for the system components and subsystems as shown on the drawings.

1.2 STRUCTURED SYSTEM

- A. The West Baton Rouge Parish School Board System infrastructure requires a structured cabling system from the manufacturer's listed forming a channel solution. A channel is defined as: The end-to-end transmission path, using a single vendor solution, connecting any two pieces of application-specific equipment. Equipment cables and work area cables shall be included in the channel. Fiber jumpers and/or data patch cords of appropriate length shall be provided for all data drops, switches, and patch panels.
- B. The Certified Structure Connectivity Solutions shall have as a minimum:
 - 1. Plenum rated Category 6 for Data and for voice and Category 6A for Wireless Access Points. Cables shall be one of the manufacturer's listed in the WBR SB Technology Specifications,
 - 2. Work shall be inspected and approved at least two times by the wiring manufacturer representative – (at rough-in and at final inspection).
 - 3. All telephone and data wiring work shall be performed by a qualified telecommunications contractor regularly employed in this field. The contracting company performing the telecommunications and data work shall have been continuously in the telecommunications business for at least five consecutive years.
 - 4. The Telecommunications Contractor shall be regularly employed in the telecommunications industry, shall be licensed in the State of Louisiana in the Telecommunication and Fiber Optic Cable specialties for at least five (5) years, shall be certified by the manufacturer of the equipment installed this project and shall have an RCDD certified technician assigned to this project.
 - 5. In addition to being certified by the manufacturer, this Contractor shall also be able to provide the specified extended warranties.
- C. The Contractor shall be aware the intent of this project, shall be to provide a complete and tested data system for the buildings included in this project. It shall be the Contractor's responsibility to provide the fiber optic interface between the MDF location and each IDF as required, including, but not limited to, fiber optic shelf, breakout devices, terminations, separate data cabinet, etc. as required to affect a fully operational Data System as required by the WBR SB. The devices and systems described further herein establish the minimum requirements for the completed Data System as shown on the drawings.

1.3 QUALITY ASSURANCE

- A. All work and equipment shall conform to the appropriate portions of the following specifications, codes and regulations as described further herein by the WBRSB Version 2020.9 specifications.
 - 1. National Electric Safety Code (NESC)
 - 2. National Fire Protection Agency (NFPA)
 - 3. National Electrical Code (NEC)
 - 4. Any Applicable State and Local Codes.
- B. If conflict exists between applicable documents, then the more stringent requirement shall apply.
- C. Maintenance Considerations – The cable and wire system shall be installed to maximize the safety, maintainability, and performance effectiveness of maintenance personnel and minimize the demands upon skills, training and manpower. Wiring solutions and terminations shall be placed and supported with convenient accessibility so as to maximize the efficiency and ease with which it can be maintained. No cables shall be spliced this project.

1.4 CONSTRUCTION STANDARDS

- A. The installed communications system shall comply with the West Baton Rouge Parish School Board Department of Technology Services VOICE AND DATA COMMUNICATION CABLING specifications. A copy of this document is included further herein for reference only. Contractor shall comply with the product specification and installation requirements described in the document.
- B. The installed communications system for the Service Provider of the Ethernet services shall be provided per the attached general requirements.

1.5 SHOP DRAWINGS

- A. Shop drawings shall be submitted for approval and shall include catalog and other information shown to describe the cables, wire, and equipment proposed.

PART 2 – PRODUCTS

- 2.1 See the WBRSB Technology specifications further herein for specific details.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unless otherwise specified, all communications systems shall be permanently installed

and connected to the wiring system. The systems must be installed according to manufacturer standards and recommendations.

- B. The Contractor shall meet with the Engineer, wiring system subcontractor, wiring solution representative and the West Baton Rouge Parish School Board Technology Services representative to review wiring paths. This meeting shall also be used to coordinate the voice/data system installation with the Owner's ordering of electronic equipment required for the facility. This meeting shall also be used to prevent problems with the data wiring during installation.
- C. Test results and as-built documents will be provided to the West Baton Rouge Parish School Board Technical Services in both hard copy and electronic copy, furnished on a CD.
- D. Wiring map/as built documents showing voice and data outlets, device numbers, room locations, and termination locations will be displayed in each wiring closet.
- E. All fiber runs must be home run with no splices.
- G. Voice and data wiring routed above accessible ceilings shall be supported on J-hooks and shall be loose bundled using Velcro wraps.
- H. Voice and data wire bundles shall not include power wiring or wiring for low voltage systems (fire alarm, intercom, security, CCTV, etc.).
- I. Cabling installed in underground or under slab conduits shall be suitable for the environment installed and shall be compliant with the structured connectivity solution.

3.2 DATA SYSTEMS GENERAL REQUIREMENTS

- A. All cables, wires, and equipment shall be securely and neatly installed. Inside routing be installed parallel and perpendicular to existing structural lines and members
- B. Each station wire shall be plainly marked per the WBRSB specifications.
- C. Data cables shall be routed above ceilings, with cables neatly bundled. Cables must not be tie-wrapped. No more that 30 cables shall be bundled.
- D. Contractor shall maintain recommended correct bending radius, pulling tension, and cable support requirements. Cable ties may be finger tight, however, not so tight so they distort the outer jacket of the cable.
- E. Cable suspended above an open ceiling shall not rest on ceilings tiles or lighting fixtures and shall be supported from roof structure at 4' to 6' intervals.
- F. Data wiring system shall be installed in accordance with NEC Article 800-5 and 6 requirements and wiring solution requirements.

3.3 FIBER CABLE INSTALATION

- A. Fiber cables shall be terminated using type connectors as described in the WBRSB Technology specifications further herein.
- B. All single-mode fiber cables shall be terminated at both ends and Contractor shall coordinate termination of fibers at source end.

3.4 DATA SYSTEM QUALIFICATIONS

- A. The data system installer shall be experienced in the design, fabrication and installation of data premise distribution systems of similar size and scope to this project.

3.5 CABLE/WIRE IDENTIFICATION

- A. Each cable shall be clearly labeled and identified in accordance with the WBRSB Technology specifications further herein.

3.6 DOCUMENTATION AND TESTING

- A. Upon completion of construction, the Contractor shall provide "as built" drawings showing the exact placement of all outlets, cables, conduits and connecting hardware called for in this section. This shall be given in CD form and hard copy form to the owner.
- B. Contractor shall provide "as built" data system drawings, in hard copy form, consisting of laminated full-size floor plans framed and wall hung adjacent to each respective data cabinet or as directed by the WBRSB IT Department.
- C. Data wiring shall be tested upon completion of installation. Data shall contain no defective pairs nor near fails and shall be tested in accordance with Channel Solution standard per TIA/EIA 568-B.
- D. The test procedures shall demonstrate, at a minimum:
 - 1. Continuity of each conductor from end-to-end – open test.
 - 2. Shorted conductors with other conductors – short test.
 - 3. Proper polarity o paired conductors from end –to – end – reverse test (for correct tip & ring and data terminations).
 - 4. Proper termination of wire pairs from end-to-end – cross test (for splits and other wrong terminations)
 - 5. Proper ground and shield bonding (for shielded cables only) – effective ground test (for zero potential difference bonding).
 - 6. Grounded conductors (for all cables) – ground fault test.
 - 7. Detection of AC or DC power on any conductor – power fault test.
 - 8. All data cables shall be tested per EIA/TIA 568 B2.1 Level III requirements.

- E. Prior to testing of any communications cable/wire and hardware, the Contractor shall notify the Architect and Engineer, in wiring, at least two (2) weeks in advance of testing. Contractor shall furnish hard copy of all test reports to the Architect for approval prior to completion and final acceptance of project.
- F. The data system shall be warranted and category compliance certified from the data outlet to the patch panel and shall be channel certified.

3.7 BONDING AND GROUNDING

- A. Grounding and bonding of the communications system shall be in strict accordance with TIA 607, National Electrical Code, And NFPA requirements. Grounding and bonding shown on the drawings represent a minimum requirement.

3.8 WEST BATON ROUGE PARISH SCHOOL BOARD TECHNOLOGY SPECIFICATIONS

- A. The following is a copy of the West Baton Rouge Parish School System Department of Technology Services Specifications. The Contractor shall be aware, all data, voice, CCTV, Security, Fire Alarm, Intercom Systems shall meet the following specifications as a minimum. The Contractor shall obtain (if different than below) and follow the latest edition of these specifications prior to performing any work for this portion of the project.

GENERAL TECHNOLOGY SPECIFICATIONS FOR WBRPSB PROJECTS

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and division 1 Specification Sections, apply to this section.

SUMMARY

- A. This section includes general requirements specifically applicable to the West Baton Rouge Parish School Board voice and data Infrastructure-Division 16741.
 - 1. This section includes: Equipment, materials, labor, and services to provide telephone and data distribution systems including, but not limited to:
 - a. Raceway, boxes, and cable tray
 - b. Telephone and data cabling terminations
 - c. Optical fiber and terminations
 - d. Telecommunications outlets
 - e. Terminal blocks/cross-connect systems

- f. Equipment racks and cabinets
- g. System testing
- h. Documentation and submissions
- i. Removal of abandoned cable

B. Work Specifically Excluded from Project:

- 1. Incoming common carrier services
- 2. Private Branch Exchange Systems
- 3. Wide Area Network Systems
- 4. Materials provided by the owner as identified in the Contract Documents.

C. The Cabling Contractor shall be responsible for:

- 1. Providing all additional materials, and the necessary labor and services required to ensure all components of the system are completely installed in accordance with the intent of the Contract Documents.
- 2. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
- 3. Coordinating the details of facility equipment and construction for all specification divisions that affect the work covered under this Division.
- 4. Coordinating all activities with the overall construction schedule.
- 5. Developing bill of materials, performing material management and efficiently using the materials whether they are issued by the General Contractor, the owner, or purchased by the Cabling Contractor.
- 6. Ensure materials, in excess of those required to complete the project, are kept in their original condition and packaging for restocking.
- 7. Furnish and install firewall penetrations, where applicable.

D. Intent of Drawings:

1. Communications plan drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc. All dimensioned locations and elevations are approximate. The Cabling Contractor is responsible for the field coordination of communications work with the other trades prior to beginning work.
2. The Cabling Contractor shall be responsible for the proper placement and routing of equipment, cable, raceways, cable tray, and related components; according to the Contract Documents and subject to prior review by the General Contractor.

Refer all conflicts between Contract Documents to Contractor for resolution.

REFERENCES

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (2005 edition of the National Electrical Code®), IEEE C2 2007 (NESC 2007), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
 1. ANSI/NECA/BICSI-568-2006—*Standard for Installing Commercial Building Telecommunications Cabling ANSI/TIA/EIA Standards*
 2. ANSI/TIA/EIA-568-B.1—*Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements* ANSI/TIA/EIA-569-B—*Commercial Building Standard for Telecommunications Pathways and Spaces*
 3. ANSI/TIA/EIA-568-B.2—*Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components*
 4. ANSI/TIA/EIA-568-B.3—*Optical Fiber Cabling Components Standard*
 5. ANSI/TIA/EIA-606 (A)—*The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*
 6. ANSI-J-STD-607 (A)—*Commercial Building Grounding and Bonding Requirements for Telecommunications*

7. TIA-526-7-OFSTP-7—*Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant*
 8. TIA-526-14A-OFSTP-14—*Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant*
 9. ANSI/TIA/EIA-758(A)—*Customer-Owned Outside Plant Telecommunications Cabling Standard*
 10. TIA-TSB-140—*Additional Guidelines for Field Testing Length, Loss and Polarity of Optical Fiber Cabling Systems*
- B. Install Cabling in accordance with the most recent edition of BICSI publications:
1. BICSI®—Telecommunications Distribution Methods Manual
 2. BICSI®—Installation Transport Systems Information Manual
 3. BICSI®—Network Design Reference Design Manual
 4. BICSI®—Outside Plant Design Reference Manual
 5. BICSI®—Wireless Design Reference Manual
 6. BICSI®—Electronic Safety and Security Design Reference Manual
 7. Infocomm/BICSI—AV Design Reference Manual
- C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the Cabling Contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

DEFINITIONS

- A. Active Equipment: Electronic equipment used to develop various WAN and LAN services.

- B. BICSI: Building industry consulting service international.
- C. Backbone: A cable or conductors and its pathway between any of the following: telecommunications rooms, telecommunications enclosures, common telecommunications rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.
- D. Bonding: Permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
- E. Building Equipment Room (BER) (Also referred to as IDF or equipment closets): Room in each building used to distribute networking and communication services throughout the building. (These locations allow remote connections away from the Main Equipment Room. Typically, the BER contains passive equipment used for electrical protection (protectors) and building cross-connect, and active network equipment used for LANs. The BER may also serve the function of a Telecommunications room (TR).
- F. Cabinet: Freestanding, floor-mounted, modular enclosure designed to house and protect rack-mounted electronic equipment.
- G. Cable Tray: Vertical or horizontal open supports usually made of aluminum or steel that is fastened to a building ceiling or wall. Cables are laid in and fastened to the trays. A cable tray is not a raceway.
- H. Campus: Grounds or buildings of a multi-building premises environment.
- I. Channel: The end-to-end transmission path between two points at which application specific equipment is connected; may include one or more lines, cross-connect jumper and/or patch cords, and work area station cords. Does not include connection to active equipment.
- J. Communications Equipment Room: See Telecommunications Room (TR)
- K. Cross-Connect: Equipment used to terminate and tie together communications circuits.

- L. Cross-Connect Jumper: A cluster of twisted-pair conductors without connectors used to establish a circuit by linking two cross-connect termination points.
- M. EMI: ElectroMagnetic Interference
- N. Fiber Optic Distribution Unit (FDU): Cabinet with terminating equipment used to develop fiber optic cross-connect facilities.
- O. Grounding: A conducting connection to earth, or to some conducting body that serves in place of earth.
- P. Hinged Cover Enclosure: Wall-mounted box with a hinged cover that is used to house and protect electrical devices.
- Q. Horizontal Cabling: Cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. Also the cabling between and including the building automation system outlet or the first mechanical terminations on the horizontal connection point and the horizontal; cross-connect.
- R. Horizontal: Pathway facilities and media connecting MER, BER and TR to Telecommunications Outlets (TO).
- S. IDC: Insulation Displacement connector
- T. Jack: Receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight-position/eight-contact modular jacks.
- U. Link: A transmission path between two points, not including terminal equipment, work area cables, and equipment cables; one continuous section of conductors or fiber, including the connecting hardware at each end.
- V. Local Area Network (LAN): Data transmission facility connecting a number of communicating devices, e.g., serial data, Ethernet, token ring, etc. Typically, the network is limited to a single site.
- W. Main Equipment Room (MER): The room used to distribute communication services to all Building Equipment Rooms (BER's) on the premises, and to interconnect premises services with the telephone companies. Typically, the MER contains passive equipment used for electrical protection (protectors) and main

- campus cross-connect, and active equipment used for telecommunications services, WAN, and LAN.
- X. Media: Twisted-pair, coaxial, and fiber optic cable or cables used to provide signal transmission path.
- Y. Mounting Frame: Rectangular steel framework which can be a free standing equipment rack or wall mounted rack to support wiring blocks, path panels, and other communications equipment.
- Z. Passive Equipment: Non-electrical hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, wiring blocks, fiber optic termination hardware, etc.
- AA. Patch Cords: A length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross-connect.
- BB. Patch Panel: System of terminal blocks or connectors used with patch cords that facilitate administration of cross-connect fields.
- CC. Pathway: Facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, underfloor systems, raised floor, ceiling support wires, etc.
- DD. Private Branch Exchange (PBX): Private communications switching system located on the user's premises. A PBX switches voice and data calls within a building or premises and between the premises and facilities provided by public common carrier networks.
- EE. Protectors: Electrical protection devices used to limit foreign voltages on metallic communications circuits.
- FF. Raceway: An enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wireway, underfloor raceway, and surface raceway; does not include cable tray.
- GG. Racks: An open, freestanding, floor-mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.

- HH. Rack Unit (RU): A unit of measure of vertical space in an equipment rack. One rack unit is equal to 45mm (1.75 in).
- II. RCDD: registered communications Distribution Designer
- JJ. Telecommunications Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station equipment.
- KK. Telecommunications Room (TR): Distributes communications services to users within a serving zone and interconnects with the BER. Typically, the TER contains passive equipment used for cross-connect and active network equipment used for LANs. TR is sometimes referred to as the communications equipment room.
- LL. UTP: Unshielded Twisted Pair
- MM. Wide Area Network (WAN): A data communications system that uses telecommunications circuits to link LAN's that are distributed over large geographic distances.
- NN. Wiring Block: Punch down terminating equipment used to develop twisted-pair cross-connect facilities.

PERFORMANCE REQUIREMENTS:

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIS-568-B.1, when tested according to test procedures of this standard.

SYSTEM DESCRIPTION:

- A. The owner will implement a comprehensive integrated communications distribution system, as described in paragraph B below, to provide wiring infrastructure which may be used to support one or more of the following services and systems:
1. Data and Voice Telecommunications.
 2. Wireless systems.
 3. Facilities management systems.

- B. The communications distribution system consists of the following major subsystems, as specified elsewhere:
1. Interbuilding Backbone: The interbuilding subsystem refers to all fiber optic backbone communications cabling connecting the Main Equipment Room (MER) to each building equipment room (BER) in all buildings on the campus.
 2. Intrabuilding Backbone: The intrabuilding subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Building Equipment Room (BER) to each Telecommunication Room (TR) in the buildings.
 3. Communication Rooms: The communications room contains the distribution subsystem comprised of the passive components used to terminate cabling subsystems and distribute communications services. This subsystem includes installations in the Main Equipment Room (MER), Building Equipment Rooms (BERs), Telecommunications Rooms (TRs) and Telecommunications Enclosure (TEs).
 4. Horizontal Distribution: The horizontal distribution subsystem refers to all infra-building twisted-pair and fiber optic communications cabling connecting telecommunications rooms (TRs) to telecommunications outlets (TOs) located at individual work areas.
 5. Work Area Distribution Subsystem: Patch cords, adapters, and devices located between the TO and station equipment.
- C. The communications distribution system is based on a combination of the following communications transmission technologies:
1. 4-pair unshielded twisted-pair cable (Cat 6)
 2. 4-pair unshielded twisted-pair cable (Cat 6a)
 3. Multi-pair unshielded twisted-pair cable (Cat 3)
 4. 9/125-micron single-mode fiber optic cable
 5. 8-position telecommunications jacks (Cat 6 and Cat 6a)
 6. 8-position telecommunications patch panels -(Modular) (Cat 6 and Cat 6a)
 7. Insulation displacement connector (IDC) type field terminated wiring blocks

8. Factory Terminated copper patch cords
 9. Rack mount fiber optic hardware
 10. Wall mounted fiber optic hardware
 11. Fiber optic connectors (typically LC)
 12. Factory terminated optic patch cords
- D. The work locations and limits of work should be shown on the drawings.

SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component. Show equipment rack assemblies, method of field assembly, workspace requirements, and access for cable connectors.
 2. Include counts of the number of drops in total and terminated in each MER and BER.
 3. Include counts of the number of cameras and wireless access points (WAP) being used at the site.
 4. System Labeling Schedules: Copy of labeling schedules.
 5. Overall system block diagram.
- C. General:
 1. Provide ongoing inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.
 2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of it are clearly indicated and non-applicable portions clearly deleted or crossed out.
 3. When the specifications include product descriptions, model numbers, part numbers, etc. that have been superseded, changed, or discontinued, the Contractor

shall submit a comparable substitution prior to the bid process for review by The West Baton Rouge Parish School Board Telecommunications.

4. The contractor shall be a Panduit's Certified Installer (PCI), and hold current certificate stating that the Cabling Contractor is in good standing in the Panduit PCI program. (Or certified on equivalent, approved substation.)
 5. Contractor shall provide a minimum 2-year manufacturer warranty on all cabling and connectivity.
- D. Provide all applicable portions of the following information with the Bid:
1. Documentation establishing qualifications to perform installation functions as required in 1.5.
 2. Statement demonstrating an understanding of project scope and schedule which includes the following information:
 - a. Where (city, office) the project will be staffed.
 - b. Project organizational chart with team member names; e.g., project manager, principal skilled technicians, and contractors.
- E. Provide all applicable portions of the following information within 10 days after award of Subcontract:
1. Project schedule in hard copy. Include, at a minimum, major tasks, milestones, dependencies, staffing, and durations for each task.
 2. Contractor shall then work with the General Contractor to merge this schedule into the overall construction schedule.
 3. Provide the following information for materials, components, and equipment to be furnished by the Contractor:
 - a. Descriptive literature, manufacturer's specification data sheets, and manuals.
 - b. Individual price and delivery schedules.
 - c. Manufacturer's product test data with indicator arrows.
 - d. Final Performance testing criteria and data for communications distribution system cabling systems.

QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency or contractor staff with the experience and capability and equipment to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- B. Please provide WBRSB with a diagram/map of all fiber paths. (Internal and External)
- C. Electrical components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.
- F. The following manufacturers listed have been approved for use in WBRSB construction and should be considered the minimum standard of quality. Approval of equivalents must be obtained prior to the Cabling Contractor submitting a proposal. A representative of WBRSB will determine the approval of equivalents.
 - 1. Multi-pair cable
 - a. General Cable
 - 2. Station Voice and Data Cable
 - a. General Cable
 - 3. Copper Termination Products
 - a. Panduit-Jacks and Patch Panels (Modular patch panels are required.)
 - 4. Fiber Optic Cabling
 - a. Corning Cabling Systems
 - 5. Wall Mount Racks
 - a. Hubbell Premise Wiring
 - b. Great Lakes Case and Cabinet
- G. When requesting substitutions, it is the responsibility of the contractor to submit alternate specifics showing comparability to the parts or design listed to the

Architect and WBRBSB staff.

- H. The contractor should be a Panduit Certified Installer (PCI.)
- I. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.
- J. The contractor will be certified to install and terminate both copper and fiber.
- K. Upon request by the owner, engineer or designer; furnish a list of references with specific information regarding type of project and involvement in providing equipment and systems.
- L. Equipment and materials of the type for which there are independent standard testing requirements, listings, and labels, shall be listed and labeled by the independent testing laboratory.
- M. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA-National Electrical Manufacturers Association), this equipment shall be labeled as certified or complying with standards.
- N. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.
- O. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes toward the owner and engineer/designer.
- P. All work and equipment shall conform to the appropriate portions of the specifications, codes and regulations as listed in Section 1.3.

WARRANTY

- A. Minimum two years for parts and labor on all cable and connectors.

COORDINATION

- A. Coordinate layout and installation of voice and data communication cabling with the Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carriers.
 - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and owners to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings.
 - 3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

DELIVERY, STORAGE AND HANDLING

- A. The Cabling Contractor shall protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and misalignment. Coordinate with the owner for secure storage of equipment and materials. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.

PRODUCTS

SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum performance.

MANUFACTURERS

- A. The products of manufacturers named in individual articles below are considered the minimum standard of quality unless prior approval has been obtained.
 - 1. Provide products of manufacturers as named in individual articles
 - 2. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.
- B. **FABRICATION**
 - 1. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of equipment and its installations.
- C. **SUITABILITY**
 - 1. Provide products that are suitable for intended use, including, but not limited to, environmental, regulatory, and electrical.

PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable ties slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-Rings.
 - 3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
 - 1. Outlet boxes shall be single-gang unless noted otherwise on drawings.



INSIDE TELEPHONE FEEDER CABLE

- A. Inside telephone feeder cable shall be multi-pair telephone cable designed for inside wiring. *(This should only be provided where specifically requested by owner. Most phones are VoIP.)* The cable shall have the following characteristics:
1. Conductors shall be solid, 24-gauge, annealed copper. Strands shall be individually insulated, polyethylene insulated cable, and twisted into pairs.
 2. Number of pairs in cable shall be noted for each job.
 3. Individual conductors shall be color-coded.
 4. The cable shall have an overall jacket/sheath rated, per NEC code, for use in a plenum space, a "CMP" rated.
 5. Cables shall be one of the following products or prior approved equal:
 - a. General Cable
Part designation 752785 (25 pair cable)
Part designation 752793 (50 pair cable)
Part designation 752819 (100 pair cable)
(Available in a 25-pair cable to a 300-pair cable)

WORK AREA OUTLETS (WAO)/DATA STATION CABLING

- A. Classroom/Teacher Stations
1. Shall consist of a single gang 1 Port faceplate with two (2) Category 6 RJ-45 data jacks through 1 inch conduit at each location wired T568B.
- B. Office Workstations
1. Shall consist of a single gang 1 Port faceplate with three (3) Category 6 RJ-45 data jacks through 1 inch conduit at each location wired T568B.
- C. Data station cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C.2-1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded twisted pair cables. The outer jacket of the cable shall be **BLUE** in color. Cable shall be one of the

following products or a prior approved equal:

1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133840
 - b. Genspeed 6 CMP-7131840
- D. Data jack shall match the color of the faceplate with color coded icons.
- E. Both wall and raceway-mounted WAO shall be mounted in single gang utility boxes.
- F. Labeling of all WAO'S is required.
- G. WAO jacks shall be a Category 6, 8-pin 8-Conductor modular jack, wired T568B and shall be from the same manufacturer as the face plates.
 1. Panduit part number:
 - a. CJ688TPEI (Electric Ivory)
- H. WAO faceplates shall be capable of accepting a variety of snap-in inserts such as RJ-45 Mini-Com modules for UTP, Fiber Optic inserts and Audio/Video inserts. Face plates must be from the same manufacturer as the jacks.
 1. Panduit part number or prior approved equal:
 - a. Two Port-CFPE2EIY
 - b. Four Port-CFPE4EIY

WIRELESS ACCESS POINT CABLING (WAP)

- A. Wireless Access for cables shall be Category 6A compliant with ANSI/TIA/EIA-568-C.2-1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded twisted pair cables. The outer jacket of the cable shall be **WHITE** in color. Cable shall be one of the following products or a prior approved equal:
 1. General Cable part numbers:
 - a. Genspeed 6A CMR-7133820
 - b. Genspeed 6A CMP-7131820

2. General Cable for outdoor Wireless Access Points:

- a. GenSPEED®10 UTP Category 6A Cable
- B. Bus Lanes should have a maximum of 3 Cat 6A Cables to provide outdoor wireless access. Reference section A above for cable specs.
- C. WAP shall be terminated at the patch panel with a Panduit Cat6A Electric Ivory data jack, and wired T568B.
 - 1. Panduit Part numbers:
 - a. Cat6 Electric Ivory Jack-CJ6X88TGEI
- D. WAP shall be terminated at the device end with a Panduit Cat6A Electric Ivory data jack, and wired T568B. For ceiling grid WAP installation, Cat6A jack shall be mounted within a 2-Port surface biscuit and placed above ceiling with a 10ft service loop. Wall Mount installations will follow installation and parts of section 2.8 with Cat6A jacks. Surface box shall be labeled in accordance with section 3.8.
 - 1. Panduit Part numbers:
 - a. Cat6A Ivory Jack-CJ6X88TGEI
 - b. 2-Port Surface Box-CBX2EI-X

IP VIDEO CABLING

- A. IP video/CCTV cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded with twisted pair cables. The outer jacket of the cable shall be **GREEN** in color. Cable shall be one of the following products or a prior approved equal:
 - 1. General Cable part numbers:

- a. Genspeed 6 CMR-7133846
- b. Genspeed 6 CMP-7131846

IP DIGITAL SIGNAGE (mounted TVs)

- A. IP video/CCTV cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded with twisted pair cables. (Jack and electrical power should be located at the height the TV will be installed. Typically it is 6 to 7 ft above the floor, but maybe higher in large spaces. The outer jacket of the cable shall be **BLACK** in color. Cable shall be one of the following products or a prior approved equal:

- 1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133847
 - b. Genspeed 6 CMP-7131847

IP ACCESS CONTROLS CABLING

- A. Video cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded with twisted pair cables. The outer jacket of the cable shall be **YELLOW** in color. Cable shall be one of the following products or a prior approved equal:

- 1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133842
 - b. Genspeed 6 CMP-7131842

IP INTERCOM SYSTEM CABLING (IF SPECIFIED)

A. IP Intercom System cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C.2-1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded twisted pair cables. The outer jacket of the cable shall be **GRAY** in color. Cable shall be one of the following products or a prior approved equal:

1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133843
 - b. Genspeed 6 CMP-7131843

PATCH PANELS/PATCH CORDS

A. All data station cabling and wireless access point cabling shall terminate on rack mounted, modular 24-port or 48-port patch panels. Panels shall be 19" rack mounted and capable of accepting a variety of snap in inserts such as RJ-45 Category 6 modules for UTP, Fiber Optic inserts and Audio/Video inserts. Multiple patch panels must be installed without rack spaces between them. Please see the technology department if you have any questions.

B. Panduit Patch Panel part number or prior approved equal

- a. 24-port-CPPL24WBLY
- b. 48-port-CPPL48WBLY

Note: Snap-in modules for Voice and Data shall be color coded to match the corresponding WAO. See Section 2.8 for WAO colors.

C. Panduit Patch Cord Part number or approved equal

- a. UTPSP7BUY (7ft)
- b. UTPSP14BUY (14ft)

FIBER OPTIC CABLING

- A. Singlemode Fiber, 9/125um core, OS2 Indoor/Outdoor, OFNR Riser Rated, all dielectric construction, UV resistant, jacketing suitable for installation in aerial, duct or riser applications. Must be a gel-free construction utilizing a water-swallowable yarn. Individual fiber strands shall be color-coded per telecommunications industry practice.

1. Transmission Performance Characteristics as follows:

Wavelength	1310nm	1550nm
Maximum attenuation (db/km)	1.0	.75
Serial Gigabit Ethernet Distance (m)	5000	-
Serial 10 Gigabit Ethernet Distance (m)	10000	40000

2. Corning Cabling Systems Part Numbers or prior approved equal:

- a. OFNR
xxxESF-T4101D20
- b. xxx Denotes strand count

FIBER OPTIC CONNECTORS

- A. Fiber optic connectors shall be Corning Unicam, Singlemode, OS2 LC style.
1. Corning Part Number:
- a. 95-200-99
- B. Fiber optic connectors shall meet or exceed the performance specifications in ANSI/TIA/EIA-568-C.3

FIBER OPTIC DISTRIBUTION UNITS

- A. Fiber Distribution Units (FDU) shall be 19" rack mountable with cable strain relief, grounding lugs, slack storage and front and rear access doors. (Sometimes also referred to as LIU (Lightguide Interconnect Units)).

- B. The FDU at the Intermediate Cross-Connect (IC) shall include the bulkhead panel and blanks for the unused panel ports. The FDU at the Main Cross-Connect (MC) shall have the appropriate number of bulkheads to accommodate the FDU's at the IC and blanks for the unused panel ports. The bulkhead panels shall be loaded with Singlemode, **LC Duplex** couplers with phosphor bronze split sleeves.
- C. The FDU shall be sized to accommodate the appropriate number of fiber connectors.
- D. Fiber distribution panels shall be labeled with each strand marked permanently with the corresponding Transmit and Receive appropriately marked.
- E. Bulkheads panels must be from the same manufacturer as the FDU.
- F. Corning part number or prior approved equal:
 - 1. FDU-CCH-01U
 - 2. FDU bulkheads-CCH-CP12-A9

FREE STANDING EQUIPMENT RACKS (Use must be approved by WBR SB Tech Dept.)

- A. 45 RMU, 7 feet high, 19 inches wide, 3 inch channel depth, EIA free-standing rack, 1000lb capacity, UL listed. (HP 847 1075mm Pallet Intelligent Rack or equivalent. Any substitution must be approved by WBR SB Technology Department and MUST include the additional wire management space provided in this cabinet. The UPS will be provided by WBR SB and will require an L6-30 twist lock plug to support it. (If needed, this unit can be an owner provided/contractor installed component. Check documentation.)
- B. Furnish and install Panduit Tack-Tape, Velcro or approved equal cable wraps for wire management. **Plastic, nylon or metal tie wraps are not allowed.**

CABINETS

- A. Wall mounted cabinets/enclosures will be used in classrooms when added to existing buildings. Vertical Hubble cabinets supporting 96 drops should be used in applications requiring less than 80 drops (Hubbell RE4B and RE4XB) with adequate space. Great Lakes enclosures.
- B. Wall mounted cabinets should be located in air-conditioned closets or equipment

rooms in new construction and can use cabinets or racks based on the security of the room.

- C. Wall mounted cabinets will be 19" rack mountable, 2-pair of 12-24 EIA/TIA tapped rails, swing out, either 24" or 36" high, Plexiglass front door and vented sides. Cabinets shall be suitable for front mounting of patch panels and/or owner furnished switches. Depth of cabinet should be confirmed with WBR SB staff to support current POE switches in use. Great Lakes Case & Cabinets part number or prior approved equal:
 - 1. 24" wall mount - GL24WDM
 - 2. 36" wall mount - GL36WDM
 - 3. 48" wall mount - GL48WDM
- D. Hubble Cabinets part number or prior approved equal. Depth of cabinet should be confirmed with WBR SB staff to support current POE switches in use.
 - 1. Hubbell RE4B and RE4XB Vertical Cabinets supporting 96 drops
 - 2. Hubbell HPWWMR48 Wall Mount 48" cabinets
- E. The Main Equipment/Communications Room (MER or Server Room) shall use an HP 847 1075mm Pallet Intelligent Rack or equivalent. Any substitution must be approved by WBR SB Technology Department and MUST include the additional wire management space provided in this cabinet. The UPS will be provided by WBR SB and will require an L6-30 twist lock plug to support it.
- F. Furnish and install Panduit Tack-Tape, Velcro or approved equal cable wraps for wire management. **Plastic, nylon or metal tie wraps are not allowed.**
- G. Cabinets should be installed on the wall with a rigidly fixed ¾" trade size, A-C grade plywood, preferably free of voids and capable of supporting attached equipment. Plywood should be either fire rated and/or covered with two coats of fire retardant paint.

CONDUIT AND RACEWAY

- A. Indoor:

1. **ORANGE** Inner-duct is required for unexposed, indoor installations of fiber.
 2. Raceway shall be Panduit raceway system and will include all elbows, T's, boots, and connectors needed for any exposed indoor fiber.
 3. Installation must include a trace wire to be installed in the Inner-duct.
- B. Outdoor:
1. Rigid conduit shall be used for above-ground installation and attachment to and between walkways or buildings.
 2. For underground installations PVC shall be a non-metallic, conduit intended for power and communications applications and suitable for the application.
 - a. Installation must include a trace wire to be installed in the conduit.

UPS POWER

- A. The UPS in the Main Equipment/Communications Room will be provided by WBRSB and will require an L6-30 twist lock plug to support it.

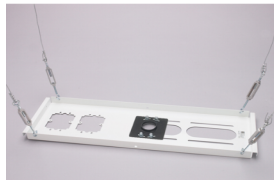
SURGE PROTECTION

- A. Protect components from voltage surges originating external to equipment housing and entering through power, communication or control leads. There is to be two levels of protection as follows:
1. All incoming 120 volt circuits.
 2. Protect communication and control, and low voltage power lines as they leave the control box and route to another separate building and as they enter the control box in the other separate building.

PROJECTORS - Caf, lib, special room. Non classroom

- A. In media centers, cafeterias and other spaces that have non-standard ceiling heights or types, the contractor must provide the mounting, wiring and all necessary components for the functioning of audio and video in those spaces. All Media Centers and Cafeterias must have audio and visual capabilities and these should be discussed with the school principal and the technology department.

- B. In new construction conference rooms and similar standard ceiling rooms, a Chief CMA440 **** mounting plate should be provided by the contractor for installation of the power outlet for a projector in each teacher workroom, conference room, and other standard ceiling rooms that are not classrooms. WBRSB will provide the remaining mounting components, HDMI cabling, and projector.



- B. One Cat6 drop and 120V power should be provided to each projector location.
- C. The projector location will be 6 to 8 feet from the designated “teaching” wall.
- D. HDMI may also be provided from a projector and through 1.5 inch conduit to a box and plate to be located at or near the space allocated for the interactive board. The contractor should provide the conduit and boxes and cover with blank plates. WBRSB may use the components specified below where required:
1. Quicktron Decora Wall Plate HDMI Pass Through-White (2225-39710-000)
 2. Quicktron Single Gang Decora Wall Plate-White (2601-03725-000)
 3. Quicktron 35ft Select in wall HDMI SS w/Ethernet (2101-50634-035)
 4. Quicktron 50ft Select in wall HDMI SS w/Ethernet (2101-50636-050)
 5. Quicktron Single Gang Aluminum 1 ½ Grommet Faceplate (2225-40489-ADT)

Classroom Active Panels

- A. The active panel location will be centered on the teaching wall. A space of 75 inches should be available for mounting the active panel.
- B. 120V power and Cat 6 cable(blue) will also be provided to the active panel through 1 inch conduit to a box and plate to be located at or near the power outlet

to each active panel at the specified location below:

1. All Classrooms: Centered at 30" above floor

C. The height of the active panel (bottom of panel to floor) specified :

1. All Classrooms: 36" above floor

Note: Contractor must check with the school principal and technology department for final height requirements.

POWER STRIPS

- A. For mounting in the racks, with 20-A, 120V AC, IU
 1. 10 Outlet NEMA 5-20
 2. 12ft Power Cable
 3. Color Black
 4. APC Part Number: AP9563 or approved equal.

EXECUTION

3.1 ENTRANCE FACILITIES A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways except within equipment cabinets, and except in accessible ceiling spaces. Raceways shall be provided in walls, in spaces with exposed ceilings, and in inaccessible ceiling areas. Conceal raceway and cables except in unfinished spaces.
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Minimum 3/4" conduit for voice/data cabling.
- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
Provide and use lacing bars and distribution spools.

PRE-INSTALLATION SITE SURVEY

- A. Prior to the start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets.
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.

EXAMINATION

- A. The Cabling Contractor must request an inspection by the owner's representative (Network Administrator) prior to completion. Agreed upon punch list items must be completed and re-inspected by the owner's representative for final approval.

HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. The Cabling Contractor is responsible for the safekeeping of your own and your subcontractors' property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of the above named property against fire, theft, and environmental conditions.

PROTECTION OF OWNER'S FACILITIES

- A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
- B.. Remove protection at completion of the work.

FIELD QUALITY CONTROL

- A. The Cabling Contractor shall be experienced in the design, fabrication, and installation of communications premise distribution systems of similar size and scope to this project. Installation technicians shall be manufacturer certified. Installer must be a PCI (Panduit Certified Installer) in good standing in the Panduit PCI program.

- B. The Communications Contractor must have installation and service facilities within a 200-mile radius of the project site. All qualifications, including the firm's facilities, shall be available for inspection by any school board official.

INSTALLATION

- A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.
- B. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having jurisdiction, and National Electrical Code® (NEC) 2005 and with manufacturer's printed instructions.
- C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
1. Where the manufacturer does not provide bending radii information, minimum-bending radius shall be 15 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.
- D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing, utilizing a firestopping assembly approved for that application.
- E. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.
- F. Installation shall conform to the following basic guidelines:
1. Use of approved wire, cable, and wiring devices

2. Neat and uncluttered wire termination
- G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings
- H. Install adequate support structures for 10ft of service slack at each TR.
- I. Support riser cables every three (3) floors and at top of run with cable grips.
- J. Limit number of four-pair data riser cables per grip to fifty (50).
- K. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the drawings or noted below:
 1. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.
- L. Voice and Data cables shall be routed above the ceilings with cables neatly bundled with Panduit Tack-Tape, Velcro or approved equal cable wraps for wire management.
 1. **Plastic, nylon or metal tie wraps are not allowed.**
 2. No more than 24 cables shall be bundled together in the ceiling.
 3. Cable ties must not distort the outer jacket of the cable.
 4. Cables suspended above the ceiling shall not rest on ceiling tiles or lightning fixtures.
- M. All strands of Fiber Optic Cabling shall be terminated
 1. Terminate using LC type connectors except where legacy enclosures or equipment require other type connectors.

GROUNDING

- A. Grounding shall conform to ANSI-J-STD 607(A)-Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code® (2005), ANSI/NECA/BICSI-568-2006 and manufacturer's grounding requirements as minimum.
- B. Bond and ground equipment racks, housings, messenger cables, and raceways.
- C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 AWG green insulated copper grounding conductor.

1. Telecommunication grounding must be isolated from other grounds.
 - a. The grounding connection shall not be made to electrical conduits, power distribution box grounds or neutral busses.

LABELING

- A. Labeling shall conform to the ANSI/TIA/EIA-606(A) standards. In addition, provide the following:
 1. Label each outlet with permanent self-adhesive label with minimum 3/16 in high characters.
 2. Label each cable with permanent self-adhesive label with minimum 1/8 in high characters, in the following locations:
 - a. Inside the receptacle box at the work area.
 - b. Behind the communication closet patch panel or punch block.
 3. Use labels on the face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.
 4. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-606(A) standard color codes for termination blocks.
 5. Mount termination blocks on color-coded backboards.
 6. Labels shall be machine-printed. **Hand-lettered labels shall not be acceptable.**
 7. Label cables, outlets, patch panels, and punch blocks with room number in which outlet is located. Each cable shall be labeled to identify the room number and outlet to which it corresponds.
 - a. Example: Room 121 has 4 drops. The numbers would be 121.1, 121.2, 121.3, and 121.4. **(If this were a lab with 33 drops the last cable drop would end with 121.33).**

8. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.
9. The Cabling Contractor shall deliver three (3) sets of as-built drawings to the owner within four (4) weeks of acceptance of the project by the owner. A set of as-built drawings shall be provided to the owner in electronic form and utilizing CAD software that is acceptable to the owner. The Cabling Contractor shall deliver the electronic media to the owner within six (6) weeks of acceptance of the project by the owner.

TESTING

- A. Testing shall conform to the ANSI/TIA/EIA-568-B.2-1 standard. Testing shall be accomplished using Level III or higher field testers.
- B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded, and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.2-1 requirements.
 2. If the horizontal cable contains bad conductors or shield then remove and replace cable.
- C. Test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant. Measured results shall be plus/minus 1db of submitted loss budget calculations. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.

1. Cables shall be tested at 1310nm and 1550 nm for singlemode optical fiber cables.
 2. Testing procedures shall utilize “Method B”-One jumper reference.
 3. Bi-directional testing of optical fibers is required.
- D. Where any portion of the system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner.
- E. All test data shall be provided with the “as built” drawings upon completion.

3.10 INSTALLATION OF PATHWAYS

- A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- C. Pathway Installation in Communications Equipment Rooms:
1. Position conduit ends adjacent to a corner on the backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 2. Secure conduits to the backboard when entering room from overhead.
 3. Extend conduits 3 inches above the finished floor.
 4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- D. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.
- E. Prepare wall penetrations and verify the penetrations of fire rated walls are made using products labeled for use of wall penetrations.

3.11 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. At communication outlets, install a loop in each cable within the box before making the final termination.
11. In the communications equipment room, install a 10-foot-long service loop

on each end of the cable.

12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pulls tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than ½ inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5kVA: A minimum of 24

inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5kVA or HP and Larger: A minimum of 48 inches.

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

END OF SECTION 27 74 00

DIVISION 28
ELECTRONIC SAFETY AND
SECURITY

SECTION 28 10 00 - SECURITY SYSTEM

PART 1 – GENERAL

1.1 SCOPE

- A. The intent of this project is to provide a complete security system for all portions of the school. The following specifications are to establish the quality of the components and to provide the necessary components needed for a complete Security System. It shall be the Contractor's responsibility to provide any hardware and software as required to insure a complete and fully operational Security System for the entire school shall be provided. Software shall provide separate partitions to the Security System for each of the areas shown. Provide a complete and operational security system that monitors and sends alarms signals to remote monitoring sites when the system detects a breach in security as monitored from motion detectors located on of all exterior doors and windows located as shown on the drawings. The locations shown establish the minimum requirements. Provide additional motion detectors as needed to provide complete coverage of all spaces in the school. The system shall include all labor and equipment necessary to furnish a complete and operational system. This shall not be limited to the items specified in these documents but shall include all items needed to provide a complete and fully operational system. All cabling shall be plenum rated.
- B. The Security system shall contain, but not be limited to:
 - 1. Controller complete with
 - a. Central Processing Unit
 - b. UDAC central station dialer
 - c. Power Supply
 - d. Backup batteries
 - 2. Keypad Control Units – LCD zoned Keypad
 - 3. Infrared Motion Detectors

1.2 SCOPE

- A. EXTENT
The Contractor shall furnish all equipment, materials, labor, supervision and services necessary for, or incidental to, the installation of a complete and operating electronic security system. Each building partitions shall be capable of being turned on and off individually through any of the keypads connected to the system.

1.3 RELATED WORK

- A. All electrical control wiring shall be furnished and installed under this section, unless shown on the electrical drawings. Low voltage wiring shall be installed in conduit

- suitable for the application in exposed areas and in vertical risers between floors. Low voltage plenum rated wire installed on 'J' hooks may be used without conduit in concealed but accessible areas. All conduit on roofs shall be rigid with rain tight fittings. Line voltage control wiring shall be run in conduit.
- B. All power wiring associated with the security system shall be provided.
 - C. The contractor shall coordinate with Engineer/Owner the final location of keypad controllers before installation. This contractor shall test the security system prior to the turn over test with the owner.

1.4 REFERENCE STANDARDS / SUBMITTALS

A. STANDARDS

Except as modified by this Specification, conform to the applicable provisions and recommendations of the latest editions of the following standards:

1. American Society for Testing and Materials (ASTM)
2. Factory Mutual (FM)
3. National Electrical Code (NEC)
4. National Fire Protection Association (NFPA)
5. Underwriters' Laboratories (UL)

B. SUBMITTALS

The Contractor shall submit to the engineer complete submittal information for review and approval. No work shall be initiated prior to the submission of these documents. These documents shall include 7 sets of specific wiring diagrams, floor plan layout, specifications sheets, and equipment schedule. At completion of project as-built drawings shall be provided detailing all actual changes complete with owner's manuals.

1.5 RESPONSIBILITY

The contractor shall be responsible for providing a Security System that shall completely accomplish the implied or intended functions of the System as shown or indicated on the drawings and/or as specified herein. This contractor shall include all cost associated with providing the UDACT equipment needed to communicate with the Central Station. The owner shall provide the dedicated phone lines for communications.

A. WARRANTY

Provide maintenance of the system during the warranty period with the following minimum provisions:

1. Notify the building owner's representative prior to performing any maintenance work.
2. Provide the designated representative to monitor and report on equipment performance and service history and be a liaison with the building owner.
3. Conditions: The warranty shall cover any defects in materials and workmanship including installation and programming which shall be found

during the term. This shall include any deficiencies in installation standards vis-à-vis the specifications.

4. Response: The contractor shall respond to calls for warranty service within 24 working hours.
5. Qualifications: The contractor shall utilize factory-trained technicians located within 20 miles of the job site.

B. EXTENDED SERVICE AGREEMENT

Provide a renewable annual maintenance agreement. The agreement shall provide for periodic inspections and maintenance of repair items. The agreement shall at a minimum provide for all of the terms and conditions of the warranty.

1.6 TRAINING

- A. The contractor shall supply 6 hours to train key customer personnel in the operation and maintenance of the installed system.

1.7 SUBSTITUTIONS

- A. The system described herein is based on a Bosch product.
- B. Equivalent security systems by Honeywell shall be acceptable.
- C. Request prior approval with sufficient data for evaluation for any other manufacturer.

PART 2 – PRODUCTS

2.1 SECURITY SYSTEM

- A. The Contractor shall provide, install, and program a functionally complete, integrated Digital Alarm Communicator and Access Control System (DACS) per Manufacturer's guidelines, codes described, and these specifications. The system shall include motion sensors, keypads, control panel, and shall remote connect to the existing A School System offsite security control panel.
- B. The DACS system specified herein shall include a Digital Alarm Communicator Transmitter (DACT), built-in-telephone line monitor, 500 event (minimum) memory logger, real time clock, calendar, test timer, battery charging / voltage supervision circuitry, battery lead supervision, diagnostics displays, time / event-based scheduling system, lightning / EMI protection circuits, and the associated optional modules and components for a complete DACS system. The system shall be protected from EMI and lightning surges.
- C. The control panel equipment, systems, and materials furnished and installed under this section shall be installed in accordance with the applicable standards of National codes (NEC, NFPA, UBC), and shall be UL listed for Access Control. The Contractor upon completion of installation shall furnish training in the complete operation of the systems.

- D. The security control system shall be a Radionics model D9412 series, provided, at minimum, with the following components. Additional accessories shall be provided based on the quantities and features required for the application.
- Enclosure(s), with locks and keys.
 - Radionics D9412 DACT with removable terminal blocks and mounting bracket.
 - Faceplate shield and metal bracket covering rear of D9412 circuit assembly.
 - Power transformer, with UL transformer enclosure; 16.5 VAC, 40 VA.
 - Manuals.
 - Sealed lead-acid battery, 7 AH minimum.
 - UL – 12V auxiliary battery charger. Combined with external batteries standby time and provides additional power to auxiliary outputs of D9412B.
 - Ceiling Mount PIR Motion Detector, 60ft. (18 m), with built-in POPIT.
 - Point of protection Expander module. Each POPEX (up to two per system) shall monitor up to 119 model D9127 Point of Protection Input Transponders “POPIT” or integrated Fire or intruder Alarm detectors.
 - Dual telephone line module – Alternates event transmission to Central Station between primary and secondary phone lines. Transmits over other phone line when first phone line is determined to be inoperable. Periodically tests phone line for usage and integrity and reports to central station when phone line is faulty. Remembers faulty line and transmits over operational line.
 - Wiegand and PIN Keypad.
 - POPIT module – tampered, UL-listed for fire.
- E. Programming of the system shall include the following tasks:
- Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters)
 - Programming operational parameters such as opening/closing reports and windows, system response text (custom English) displays events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.
 - Programming passcodes according to the authorities and functions defined by the owner.
 - Other system programming tasks required by the owner. These additional programming requirements shall be coordinated between the owner and the contractor.

2.1 SECURITY SYSTEM OPERATION:

Provide a complete and operational partitioned security system consisting of keypad controlled; Infrared motion detectors and offsite monitoring.

- A. Control System –The Security system shall be a flexible system that provides the following minimum operating functions;

1. LCD Alpha-numeric Keypads – Each door shall be on a sepearate zone. When a door is opened the system shall indicate the exact location of the device in alarm.
2. The system shall be partitioned so that the keypads serve either a specific building or area or for the whole facility.
3. Each zone shall be capable of being by-passed through the keypad from authorized operators.
4. Each operator will receive their own access code to gain access and to secure the facility.
5. The system shall keep track of who turned the system on and off.
6. A report shall be capable of being downloaded to a PC.
7. The system shall allow an adjustable time period to exit and enter the building prior to setting off the system alarm.
8. The system shall have an internal UDACT which shall pass the alarm information to a remote location.
9. 60 Hours of Backup battery operation with a recharger and power supply.
10. System shall be capable of turnning off the interior motion detectors and securing the perimeter motion sensors.
11. System shall have authorized levels. Some will only be authorized to enter and exit certain areas/buildings (keypads) and others will have authority to override the whole system and enter all areas using same keycode.

B. Passive Infrared Sensor

1. UL Listed
2. FCC Certified
3. Provide various designs as needed to provide coverage of 30 ft. to 200 ft. depending upon the area of protection.
4. Combination heat and motion sensitive detection technologies shall be included to verify alarm condition (dual- technology).
5. Ability to disable LED for Stealth mode
6. Interchangeable aspheric, low-diffraction lenses, including vertical barrier, pet alleys, dense wide angle, etc.
7. Absolute white light immunity
8. Automatic PIR temperature compensation
9. Catch sensitivity: 1ft. per second
10. Trouble output supervisory feature
11. Phase sensitive PIR processing
12. Ceiling, wall, corner, flush, and swivel mountable brackets shall be provided as needed for the application.
13. Type: IntelliSense IS-150 or equivalent
14. Operation: power requirements 10-14 vdc, Operating Temperature 32 to 120°F. N.O and N.C contacts.

D. Power supply

Provide:

1. Power supply rated for the total load of the control station for all input and output modules energized, without diversity.
2. Protection against power surges and over voltages.
3. Battery backup to support panel memory for a minimum of seventy-two hours, and electromagnetic lock operation for three hours after a lost of power.
4. Spare fuses.
5. 24-volt AC/DC control circuits throughout.

PART 3 - EXECUTION

3.1 INSTALLATION

Provide all devices in locations as shown on the drawings in accordance with standard industry practice.

Provide and adequately support fixed plenum rated wiring throughout the installation. For cabling routes not specified in detail, submit a proposed route layout.

Handling cables: Handle cables to prevent damage to insulation and sheathing. Report any damage and replace or repair damaged cable as directed.

Straight-through joints: Unless unavoidable due to length or difficult installation conditions, run cables for their entire route length without intermediate straight-through joints. Where straight-through joints are used contain within a junction box arranged so that they are accessible after installation.

Tagging: Identify all cables at each end and at crowded intermediate points by means of stamped, non-ferrous tags, clipped around each cable.

Cables in false ceilings: Secure from building structure on 'J' hooks. Do not fasten cable to any other services.

Cables in conduits: Feed cables into conduits in such a way as to prevent twisting and crossing. Do not use inspection fittings for drawing in cables.

Cables on trays and ladders: Fix cables neatly to trays and ladders in single layers and parallel to the tray edge to avoid unnecessary crossovers. Fix cables at intervals not exceeding 48" by means of non-corrosive fastening materials.

Segregation: Physically segregate data cabling from power and SMS input/out cabling and mains cabling from all other cabling.

3.2 TESTING AND COMMISSIONING

- A. GENERAL: Test each component to verify its operation prior to providing the owner test.
 - B. SITE TESTING AND COMMISSIONING
Provide the following:
 - 1. Testing and calibration checks of all installed equipment.
 - 2. Testing of all field wiring from terminals to field interface terminal strips.
 - 3. Testing and commissioning of all power supplies.
Demonstrate the following:
 - 4. Action of all keypad locations and operation of all motion sensors.
 - C. FINAL ACCEPTANCE TEST
After the testing report and as built drawings have been approved by the customer's representative, the completed system shall be tested in the presence of the customers representative. Acceptance of the system shall require a demonstration of the stability of the system. Should major equipment failure occur, the contractor shall replace or repair component (s). This test shall not start until the customer has obtained 30 days beneficial use of the system.
 - D. Contractor shall be aware, at the end of the one-year warranty period, all Dealer codes, including but not limited to downloading code, master code, installer code, etc. shall be returned to the factory default settings, in an effort to allow APSS to manage all of their special system equipment.
- 3.3 NOTICE OF COMPLETION
- When the final acceptance test described above has been satisfactorily completed, the contractor shall issue a letter of completion to the customer indicating the date of such completion. The notice of completion shall be recorded by the contractor upon receipt of the customer completion letter. This date of record shall be the start of the one-year guarantee period unless defined otherwise in the project's General Conditions documents.

END OF SECTION 26 98 00

DIVISION 31
EARTHWORK

SECTION 31 00 00 EARTHWORK

PART 1 - GENERAL

1.01 RELATED ITEMS

- A. Reference: Geotechnical report

1.02 EXTENT OF WORK

- A. Perform the following within established Project limits as indicated or required:
1. Prepare existing ground surface to receive fill if needed;
 2. Site filling, including fill under foundations and paving if needed;
 3. Rough and finish grading;
 4. Excavation;
 5. Backfill.

1.03 UTILITIES

- A. Locate in-place underground utilities by careful probing and hand excavation. Protect them from damage during construction operations and relocate specific services as shown.

1.04 PROTECTION OF PERSONS AND PROPERTY

- A. Barricade open excavations and post with warning lights for safety of persons. Operate warning lights during hours from dusk to dawn each day.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damage and displacement.

1.05 SAMPLING AND TESTING

- A. The Owner will provide soil testing and inspection services for quality control during earthwork operations as required.
1. Maximum density and optimum moisture content determinations for subgrade, backfill and fill materials: Shall be in accordance with the Geotechnical Report.
 2. For in-place density determinations any of the following methods:
 - Sand-Cone Method - ASTM D 1556
 - Nuclear Probe Method - ASTM D 2922
 - Rubber-Balloon (Volumeter) Method - ASTM D 2167
- B. In-place density determinations shall be made at least one test of prepared subgrade and one test of each lift for each 2,500 sq. ft. of area in the building area and one test per lift for every 5,000 sq. ft. in the parking/drive areas.
- C. If, in opinion of Designer, based on reports of testing service and on-site inspection, fill or backfill which has been placed is below specified density, provide additional compaction and testing at no additional expense.

PART 2 - PRODUCTS

2.01 ENGINEERED FILL MATERIAL

- A. Refer to paragraph 3.02 herein for locations where engineered fill and backfill material is required.
- B. Engineered fill and backfill material shall be sandy clay or clayey sand and shall have a maximum liquid limit (LL) of forty-five (45) and a plastic index (PI) of ten (10) to twenty-five (25). All engineered fill material shall be free of wood, roots, and other deleterious materials which would prevent achieving the required compaction.
- C. Engineered fill material shall be "borrow material" obtained by the Contractor from a source other than the Owner's property, or may be material generated by required on-site excavation which meets the specified requirements. On-site material may be used as engineered fill if Testing Laboratory tests indicate on-site material is acceptable. No on-site material is to be used for engineered fill prior to testing. The Contractor shall be responsible for all costs and expenses of locating, procuring and transporting engineered fill material to the work site.
- D. Engineered fill materials shall be sampled at the borrow site and tested and classified by the Testing Laboratory before use for the project work. Notify the Designer and the Testing Laboratory, in writing, at least 15 days in advance of borrow operations so that samples may be obtained and analysis completed before borrow operations begin. The Contractor will not be permitted to begin borrow operations until soil tests have been completed and proposed materials have been approved.
- E. Soil excavated from Project site shall not be used, where structural fill material is required, unless it has been tested and conforms to the specified classification, liquid limit, and plastic index.

2.02 ORDINARY FILL MATERIAL

- A. Fill and backfill material in non-structural areas shall be ordinary fill material and shall be surplus material generated by required on-site excavation including preparation of surfaces to receive structural fill as specified in paragraph 3:01 below, to the extent it is available.

2.03 OTHER MATERIALS

- A. Topsoil: See landscape specifications.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND SURFACE TO RECEIVE FILL

- A. Clear and grub a minimum of 6" depth. There shall be full depth tree root/stump removal.
- B. Following removal of existing soil and trees, locate soft areas, remove unsatisfactory materials and backfill the resulting holes with engineered fill material.
- C. Unsatisfactory soil materials are those which cannot be compacted to the required percentage specified in paragraph 3.04.

D. In other areas, remove and dispose of vegetation, debris, obstructions and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

3.02 FILL AND BACKFILL

A. Engineered fill material only shall be used for fill and backfill under all equipment, building foundations, parking and drives.

B. In locations not defined in paragraph 3.02 A, fill and backfill material shall be ordinary fill material and may be surplus material generated by required on-site excavation to the extent it is available.

C. Fill by placing and compacting acceptable soil materials, in 9" lifts, over ground surface as required to bring existing grade to elevations indicated. Undercut as specified in paragraph 3.01 before placing fill.

D. Backfill excavations by placing and compacting acceptable soils material in 9" lifts.

E. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Waterproofing operations.
2. Underground utility installation, inspection and testing.
3. Removal of concrete formwork.
4. Removal of trash and debris.

F. Placement and Compaction:

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to percentage maximum density specified in paragraph 3.04.
2. Do not place backfill or fill material on surfaces that are muddy, frozen or that contain frost or ice. Do not place backfill or fill material on unsound surface.

G. Place backfill and fill materials evenly adjacent to structures, to required elevations. Carry material uniformly around structure to approximately the same elevation in each lift, to prevent wedging action against structure.

3.03 EXCAVATION

A. Excavate and remove all existing soil material encountered to obtain required elevations. Undercut as specified in paragraph 3.01 before placing fill. Remove and dispose of vegetation, debris and other deleterious material from excavated material which will be used for ordinary fill.

B. Correct unauthorized excavations and excavations beyond indicated subgrade elevations and dimensions as follows:

1. Excess Undercut to Receive Fill: Fill with increased depth of acceptable fill material.
2. Under Footings or Foundation Bases: Fill unauthorized excavation by extending

3. the indicated bottom elevation of the footing or base to the excavation bottom, without altering required top elevation. 3000 psi concrete fill may be used to bring elevations to proper position, only when acceptable to Designer.
 4. Elsewhere: Backfill and compact unauthorized excavations as specified for fill of same classification, unless otherwise directed by Designer.
- C. Water Control: Perform earthwork in a manner to prevent surface water and subsurface or groundwater from flowing into excavations and to prevent water from flooding Project site and surrounding areas.
1. Do not allow water to accumulate in excavations. Remove water using dewatering methods which will prevent softening and/or soil changes. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 2. Convey water removed from excavations and rainwater to collecting or run-off areas. Provide and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use excavations as temporary drainage ditches.
- D. Material Storage: Stockpile satisfactory materials until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
- E. Excavation for Foundations:
1. Conform to elevations and dimensions shown with a tolerance for over-excavation not to exceed 0.10' and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, for other construction required, and for inspection.
 2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.
- F. Conditions of Excavation: Before placing vapor barrier membranes, steel and concreting operations, bottoms of excavations shall be made relatively dry, smooth and leveled and free from debris, and in a condition to allow Engineer to inspect and authorize prior to concrete work to follow.
- G. Dry Bottom: Where soil conditions require, provide a dry bottom at all footings consisting of 6" layer of clam shells or 4" thick nonreinforced concrete slab composed of 1:3:5 mix. Dry bottom shall be subject to Engineer's approval.
- H. Lining, Bracing and Protecting:
1. Thoroughly line and brace walls and sides of all excavations as required to protect against caving or settlement and as required to maintain plumbness or line of excavation indicated.
 2. Contractor shall assume full responsibility for maintaining excavations free from cave-ins and shall employ sheeting, wales, bracing and whatever means necessary for protecting excavation.

3.04 COMPACTION - GENERAL

- A. Perform compaction of soil materials using suitable soil compaction equipment for materials to be compacted. Testing for compaction shall be in accordance with the Geotechnical Report.

B. Brace retaining walls to prevent deformation or caving from excessive loads caused by use of heavy equipment especially when rolling or tamping to obtain specified compaction.

C. Control soil compaction during construction for compliance with percentage of maximum density specified for each classification. Provide not less than the following percentage so maximum density of the same soil material compacted at optimum moisture content, for actual density of each layer of soil material-in-place:

1. Under Equipment, building slabs, parking and drives: Compact each layer of fill and backfill material to 95% of maximum density (Standard Proctor)
2. Lawns and Unpaved Areas: Compaction is not required, except as Special Erosion Protection.

D. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer, to prevent free water appearing on surface during, or after, compaction operations.

1. Remove or replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
2. Acceptable soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and permitted to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests. When accepted by Testing Laboratory, this soil material may be used as backfill or fill.

3.05 GRADING

A. Uniformly grade areas within limits of construction including adjacent transition areas. Smooth finish surface within specified tolerances. Compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Shape and rework existing ditches, and construct new ditches, to dimensions, lines and grades shown. Allow for thickness of topsoil and erosion protection, where required.

C. Grade areas adjacent to structures to drain away from structure and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:

1. Grassed Areas: Finish areas to receive topsoil to within not more than 0.10' above or below the required elevations, allowing for required thickness of topsoil. Fill to bring to required elevations.
2. Fence Lines: Grade area 10 feet wide along fence lines to provide a uniform base for the fencing. Cut and fill as necessary to limit variation from a true line to 6 inches per 100 feet. Slopes (except at ditch crossings) shall be 4:1 or less.

3.06 TOPSOIL

A. Furnish, place and fine grade a 4-inch layer to topsoil over all ground surface disturbed by construction operations, including all filled areas, which are not occupied by equipment, pavements, aggregate surfacing and similar improvements.

3.07 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion and keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.08 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove from the Project site and dispose of excavated existing material not used for ordinary fill, excess borrow material, trash and waste materials.

B. Excess soil materials shall remain the Owner's property if desired and shall be hauled and deposited by the Contractor at a location on the Owner's property but outside the Project area, as directed by the Designer. This material shall be deposited and graded as necessary to prevent ponding of rainwater and permit drainage.

END OF SECTION 31 00 00

SECTION 31 21 50 - GRADING

PART 1 - GENERAL

This section includes all grading work required for the construction of the driveway and parking improvements shown on the Drawings within the project area. Grading operations shall include rough and finish grading as indicated on the Drawings to provide adequate drainage for the project area. Grading operations shall also include rough and finish grading of ditches to provide positive drainage from pipe invert to pipe invert.

1.01 Related Work Specified Elsewhere

- A. Excavating, Backfilling and Compacting for Pavement – Section 3122200

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Site shall be graded to meet existing contours on adjacent properties to the construction site so as to provide positive drainage into existing catch basins or other drainage structures.

3.02 Finish grading shall include excavating, stockpiling, and placing approved native material as required to cover entire site to an elevation appropriate for the placing of sod or seed as required elsewhere in these specifications and as shown on the drawings.

Required fill material in excess of available native material shall be select backfill in accordance with Section 312200.

3.03 Ditch Bottom Grading

- A. Grading shall include excavating, and placing approved native material as required to obtain positive drainage from pipe invert to pipe invert. The ditch bottom shall be free of voids and pockets.
- B. Excess excavated material from ditches shall become the property of the Contractor and shall be disposed of off site, at the Contractor's expense, all in accordance with local codes and ordinances governing locations and safety laws.
- C. Contractor shall not reshape ditches side slopes, except in cases of roadway realignment encroaching on the existing ditch alignment, as approved by the Project Engineer. Ditches requiring reshaping shall have maximum side slopes of 1 vertical on 3 horizontal. In no case shall the ditches encroach upon private property.

END OF SECTION 31 21 50

SECTION 31 22 00- EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 Related Work Specified Elsewhere

- A. Gravity Sewer Lines – Section 332175
- B. Culverts and Storm Drains – Section 334150
- C. Geotechnical Report

1.02 Description.

Furnish all work, materials, equipment and related items required to remove all earth, rock, trees, tree stumps, water and other materials to the extent required to prepare the subgrade or subbase for the foundation of the facilities, and backfill around the facilities to the lines and grades established on the Drawings.

1.03 Applicable Publications

The following latest publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

Louisiana Standards Specifications for Roads and Bridges, 1992 Edition, including amendments (LSSRB)

Culverts and Storm Drains – Section 701

Aggregates – Section 1003

1.04 Quality Assurance

- A. The specifications of the American Society for Testing and Materials (ASTM) referred to in this Section listed below shall be considered a part of this Section, the same as if fully set forth herein, to the extent applicable in each reference:

D 698-70 Tests for Moisture-Density Relations of Soils,
Using 5.5 lb. (2.5-Kg) Rammer and 12-in. (304.8 mm) Drop
D 1557-70 Test for Moisture-Density Relations of Soils.

- B. Contractor shall provide certification that all materials meet the specifications.

PART 2 - PRODUCTS

2.01 Materials

- A. Backfill Materials

1. Native-Material Backfill. Good sound earth as determined by the geotechnical engineer, free from waste, rubbish, objectionable organic matter, large rocks, waste concrete, or other unstable or unsuitable material.

2. Select Backfill. As per geotechnical report and details.

B. Bedding Material

1. Crushed Stone. Limestone shall be from a source approved by DOTD. Materials shall conform to the requirements of the LSSRB, Section 1003.03(d).

2. Crushed Concrete. Crushed concrete shall be from DOTD approved stockpile and shall conform to the gradation requirements of the LSSRB, Section 1003.03(e).

3. Coarse Sand

PART 3 – EXECUTION

3.01 Excavation

A. General. Excavations shall be of such dimensions as to permit the construction of the work in the manner, shape and size shown on the Drawings. Excavation shall extend a sufficient distance from walls to allow for placing and removal of forms, installation of piping, mechanical compaction of backfill materials and inspection. Excavation shall not be plowed, scraped or machine dug closer than 3 inches to the finished subgrade elevation. Remove the last layer of excavation by hand or other means approved by the Engineer to the exact lines and grades shown on the drawings. The exposed surface shall be undisturbed and all loose material shall be removed from the bottom of the excavation so the foundation will be clean and firm. Final removal and replacement of the foundation material and subbase compaction to grade shall not be made until just before the concrete or masonry is placed. When any structural excavation is completed, the Contractor shall notify the Engineer who will make an inspection of the excavation. No concrete or masonry shall be placed until the excavation has been approved by the Engineer.

B. Unauthorized Excavation. Whenever the excavation is carried beyond or below the lines or grades shown on the Drawings due to an error by the Contractor and not for the purpose of removing stumps, logs, roots, etc., refill all such excavated space below the structure foundation with concrete. Also, if the bottom of the excavation is made mucky or unstable due to the Contractor's operations or carelessness, the excavation shall be deepened to undisturbed soil just before concreting operations; and the thickness of structural concrete or depth of fill material as determined by the Engineer shall be increased accordingly without additional compensation to the Contractor.

C. Excavation to Remove Stumps, Roots, Logs, Etc. The Contractor shall probe one (1) foot below the established bottom of the excavation. If any stumps, logs or roots, etc., are discovered by this probing, the Contractor shall cut them out and refill all such excavated space below the structure foundation with concrete if ordered by the Engineer. This work shall be considered incidental to the construction of the project facilities.

D. Material Storage and Disposal. Contractor shall retain ownership of all excess soil and clay material arising out of the Contractor's performance of the Work. Contractor shall remove and dispose of all such material to a legally approved off-site area.

- E. Blasting. Explosives shall not be used.

3.02 Bedding and Backfilling for Concrete and Brick Structures

- A. Only after concrete walls have attained the required compressive strength shall any backfill be placed.
- B. Cast-in-place concrete base slabs shall be allowed to cure for a minimum of 7 days before backfill is placed into the excavation unless directed otherwise by the Engineer.
- C. "Native Backfill" may be used where shown on the drawings within the roadway right-of-way and shall be placed in layers not to exceed eight (9) inches deep mechanically compacted to the approximate density of the adjacent soils. In lieu of such densities, Contractor has the option of utilizing "Select Backfill" at no additional expense to the Owner.
- D. All structural backfill operations shall consist of backfilling with select backfill material (river sand). From the stone bedding up to a depth of 2 feet below final grade, this material shall be placed in lifts of 12 inches loose measure and compacted with a power tamper to a minimum density corresponding to 95 percent of the maximum dry density at optimum water content in accordance with ASTM D698. The final 2 feet of select granular backfill shall be compacted to a minimum density corresponding to 98 percent of the maximum dry density at optimum water content in accordance with ASTM D1557. If flooding is used for compaction, 2 foot lifts may be used.
- E. Bedding material shall be crushed stone or crushed concrete placed and compacted as shown on the Drawings and in accordance with LSSRB, Section 726. The bedding shall be compacted to 95 percent of the maximum dry density

END OF SECTION 31 22 00

SECTION 31 22 50 - EXCAVATING, BACKFILLING AND COMPACTING FOR PAVEMENT

PART 1 - GENERAL

1.01 Related Work Specified Elsewhere

- A. Cement Concrete Pavement – Section 321313
- B. Geotechnical Report

1.02 Description

The Contractor shall furnish all materials, labor and equipment necessary to remove all earth, rock, water, debris and other materials to the extent required for the construction of the improvements shown on the Drawings. Also included is the preparation of the subgrade and base and the backfilling and compaction around the improvements to the lines and grades established on the Drawings.

1.03 Applicable Publications

The following latest publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

Louisiana Standards Specifications for Roads and Bridges, 2006 Edition, including amendments (LSSRB)

Excavation and Embankment – Section 203

1.04 Excavation

Excavation shall extend to the width and depth shown on the Drawings or as specified.

1.05 Backfilling

The bottom of the excavation shall be firm, dry, and in all respects, acceptable. The Contractor shall be required to place suitable excavated roadway base and/or select backfill in accordance with the Drawings, LSSRB Section 203, and these specifications, to the proper grade prior to stabilizing the base course.

PART 2 - PRODUCTS

2.01 Select Backfill

As per geotechnical report and details

2.02 Suitable Excavated Roadway Base

Good sound base material excavated from beneath the existing roadway and found to be free from waste, rubbish, objectionable organic matter, large rocks, waste concrete, or other unstable or unsuitable material.

2.03 Native Material

Good sound earth as determined by the geotechnical engineer, free from waste, rubbish, objectionable organic matter, large rocks, waste concrete, or other unstable or unsuitable material.

PART 3 - EXECUTION

3.01 Excavation

A. In case the excavation is carried below the required depth as shown in the details due to an error by the Contractor not for the purpose of removing stumps, roots, logs, etc., the Contractor shall fill and compact the bottom of the excavation up to grade with base material in a manner acceptable to the Engineer, without additional compensation for the materials, excavation or the backfilling.

B. All material excavated shall be placed so as to minimize interference with public travel and to permit proper access for inspection of the work.

3.02 Disposal of Materials

All excess excavated material not required for regrading shall be removed from the site of the work by the Contractor and disposed of at a legally approved off-site area at no cost to the Owner.

3.03 Over-Excavation to Remove Stumps, Roots, Logs

A. Stumps, roots, and logs which are encountered within the roadway area shall be cut to a depth of one (1) foot below the bottom of the base course. The Contractor shall fill this excavated space with compacted backfill material.

B. When so required by the Engineer, the Contractor shall probe one (1) foot below the established bottom of the base course. If any stump, roots, logs, etc., are discovered by this probing, the Contractor shall cut them out just as if they had been visible in the road bed.

C. Blasting will not be allowed for the removal of stumps.

3.04 Backfilling

Low areas of the roadbed shall be filled with suitable excavated roadway base. All roadway fill shall be placed in layers up to the bottom of the pavement and thoroughly compacted to 95% of maximum dry density in accordance with ASTM D-1557. Maximum lifts shall be 9 inches.

Under nonpaved shoulder areas, native material shall be placed. Fill in excess of available native material shall consist of select backfill. All shoulder fill shall be placed in layers not exceeding 9 inches deep and compacted to approximate density of the adjacent material to eliminate voids.

Broken paving shall not be placed in backfill.

3.05 Restoring Adjacent Surfaces

The surface of any driveway or any other area which is disturbed by the roadway excavation and which is not a part of the roadway shall be restored by the Contractor to a condition at least equal to that existing before work began.

Cohn Elementary School
Additions & Renovations
805 14th Street, Port Allen, LA. 70767
64-002-24A

END OF SECTION 31 22 50

SECTION 31 23 19 – DEWATERING

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 construction dewatering.
- B. Related Requirements:
 - 1. Section 01 32 33 "Photographic Documentation" for recording preexisting conditions and dewatering system progress.
 - 2. Section 31 20 00 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.
 - 3. Section 33 46 00 "Sub drainage" for permanent foundation wall, underfloor, and footing drainage.

1.03 ALLOWANCES

- A. No allowance provided

1.04 PREINSTALLATION MEETINGS

- C. Preinstallation Conference: Conduct conference at Cohn Elementary School unless otherwise directed by Engineer.
 - 1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review condition of site to be dewatered
 - 3. Coordination erosion-control measures and temporary controls and protections.
 - 4. Review geotechnical report.
 - 5. Review proposed site clearing and excavations.
 - 6. Review existing utilities and subsurface conditions.
 - 7. Review observation and monitoring of dewatering system

1.05 ACTION SUBMITTALS

- A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
 - 3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 - 4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer] [land surveyor] [and] [professional engineer].
- B. Field quality-control reports.
- C. Existing Conditions: Using [photographs] [or] [video recordings], show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.
- D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in [design of dewatering systems and dewatering work.

1.08 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

DEWATERING

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls, which are specified in [Section 01 50 00 "Temporary Facilities and Controls,"] [Section 31 10 00 "Site Clearing,"] during dewatering operations.

3.02 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.03 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

3. Maintain piezometric water level a minimum of 60 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.04 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.

2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.

3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.05 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 31 23 19

- H. Phenology: The annual cycles of plants and animals and how they respond to seasonal changes in their environment.

1.3 QUALITY ASSURANCE

A. Contractor Qualifications:

1. Experience: Minimum of 8 years experience in performing the types of services specified herein.
2. Certification:
 - a. Contractor personnel providing on-site pest control service must maintain certification as Commercial Pesticide Applicators in the category of Industrial, Institutional, Structural, and Health Related Pest Control. Uncertified individuals working under the supervision of a Certified Applicator will not be permitted to provide service under this contract.

[b. Current Pest Control Under Contract with IPSB Kitchens is “The Bug Man”. Please contact Chris for a quote to place rodent boxes around the exterior of the building (35’ on center). The bug man contact: 225-999-3274. Include a 1 year contract in the project bid.

B. Pesticides:

1. Contractor shall be responsible for application of pesticides according to the label.
2. Regulatory compliance:
 - a. All pesticides used by the Contractor must be registered with the U.S. Environmental Protection Agency (EPA) and applicable jurisdictions.
 - b. Transport, handling, and use of all pesticides shall be in strict accordance with the manufacturer’s label instructions and all applicable laws and regulations.
3. Contractor shall not store any pesticide product in the project building(s) and site.
4. Prohibited Pesticides:
 - a. Contractor shall not apply any pesticide product that has not been included in the approved IPM Plan or approved in writing by the Owner.
5. Minimization of Risk:
 - a. When pesticide use is necessary, Contractor shall employ the least risk pesticide, most precise application technique, and minimum quantity of pesticide necessary to achieve control.
 - b. Application of pesticides in any inside or outside area shall not occur unless visual inspection or monitoring devices indicate the presence of pests in that specific area.
 - c. Recommendations for preventive pesticide treatments in areas where inspection indicates a potential insect or rodent infestation will be evaluated by the Owner on a case-by-case basis. Written approval must be granted by the Owner prior to any preventive pesticide application.
 - d. Notification: Contractor shall notify Owner at least 48 hours in advance of the application of any pesticide. Exceptions may be made for applications made for emergencies, where an imminent threat to health exists (e.g., stinging insects). For emergency applications, notification must be made as soon as practical.

C. Key Pests and Action Thresholds:

key pest	action threshold	
	interior	exterior
rats	any evidence	Provide bait boxes at 35' O.C.
ants	1 complaint	1 fire ant mound within 50 feet of building/ pavement
cockroaches	1 cockroach in public areas or fresh food areas	n/a
Termites	See termite control spec	See termite control spec

- D. Coordination with construction operations:
 - 1. Review Contractor's Indoor Air Quality (IAQ) Management Plan to verify moisture controls are appropriate to anticipated IPM Plan.
 - 2. Review Contractor's Waste Management Plan to verify sanitation levels are appropriate to anticipated IPM Plan.
 - 3. Review Contractor's progress cleaning methods to verify sanitation levels are appropriate to anticipated IPM Plan.
- E. Coordination with Owner's operations:
 - 1. Coordinate with Section 01 78 23 (01830) – Operation and Maintenance Data: Sanitation information consistent with approved IPM plan.

1.4 PRECONSTRUCTION MEETING

- A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect to discuss the proposed IPM Plan and to develop mutual understanding relative to details of environmental protection.

1.5 SUBMITTALS

- A. Integrated Pest Management (IPM) Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an IPM Plan including, but not limited to, the following:
 - 1. Verify key pests and action thresholds for each key pest are appropriate to project, local ecosystem, and climate.
 - 2. Proposed IPM Strategies: Provide for each key pest, appropriate to the building, site, and local ecosystems.
 - a. Indicate strategies for inspection, prevention and for response to identified pest problems.
 - 1) Inspection: Describe methods and procedures to be used for identifying sites of pest harborage and access, and for making objective assessments of pest population levels throughout the term of the contract.
 - 2) Prevention: Describe methods and procedures recommended for prevention of pest harborage and access.
 - 3) Response: Indicate prioritization of strategies such that non-chemical controls are utilized before chemical controls; and lesser risk options are used before resorting to actions with greater risk factors.
 - 3. Proposed Materials and Equipment:

- a. Provide brand names of pesticide application equipment, rodent bait boxes, insect and rodent trapping devices, pest monitoring devices, pest detection equipment, and other pest control devices or equipment that may be used to provide service.
 - b. Commercial Pesticide Applicator Certificates or Licenses: The Contractor shall provide photocopies of State-issued Commercial Pesticide Applicator Certificates or Licenses for every Contractor employee who will be performing on-site service under this contract.
 - c. Pesticides: For all pesticides to be used, submit:
 - 1) Product data indicating conformance to U.S. National Organics Program (NOP) Final Rule list.
 - 2) Current EPA-registered label.
 - 3) Material Safety Data Sheet. MSDSs shall be prepared/updated within the previous five years and shall include responses to Sections 1 – 16 in accordance with ANSI Z400.1 and as follows:
 - a) Section 11: Toxicological Information. Include data used to determine the hazards cited in Section 3. Identify acute data, carcinogenicity, reproductive effects, and target organ effects.
 - b) Section 12: Ecological Information. Include data regarding environmental impacts in the event of an accidental release.
 - c) Section 13: Disposal Considerations. Include data regarding the proper disposal of the chemical. Indicate whether or not the product is considered to be "hazardous waste" according to the US EPA Hazardous Waste Regulations 40 CFR 261.
 - d) Section 14: Transportation Information. Identify hazard class for shipping.
 - e) Section 15: Regulatory Information. Identify federal, state, and local regulations applicable to the material.
 4. Service Schedule: Provide a complete service schedule that includes weekly or monthly frequency of Contractor visits, specific day(s) of the week of Contractor visits, and approximate duration of each visit.
 - a. Start of Service Schedule: Start of construction.
 5. Revise and resubmit Plan as required by Owner.
 - a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.
- C. Operations and Maintenance Information: Submit instructions for Owner's personnel regarding Owner operations and maintenance procedures associated with Contractor provided IPM services.
1. Include overview of potential pest problems, conventional practices and environmental impacts, and IPM practices and environmental impacts.
 2. Coordinate with landscaping maintenance program.
 3. Coordinate with building cleaning and routine maintenance programs.
- D. Field Quality Control Documentation.
1. IPM Inspection Reports
 2. IPM Deficiency Reports
 3. IPM Log Book.

2.1 CHEMICAL CONTROLS

- A. Prohibited Pesticides:
1. Pesticides containing active ingredients classified as known, likely or probable carcinogens or reproductive toxins according to any of the following lists: State of California EPA List of Chemicals Known to Cause Cancer or Reproductive Toxicity,

- State of Illinois EPA List of Known Endocrine Disrupters, US EPA List of Chemicals Evaluated for Carcinogenic Potential.
 2. Pesticides containing inert ingredients included on US EPA's List 1: Inerts of Toxicological Concern.
 3. Pesticide formulations and uses presenting a potential physical hazard or dust/powder inhalation hazard to building occupants.
 4. Pesticides with label precautionary statements including "toxic" or "extremely toxic" to bees, birds, fish or wildlife. *Does not apply to pesticides used as per label directions to control bird, fish, wildlife or stinging insect pests.*
 5. Pesticides with label precautionary statements including specific warnings regarding ground or surface water contamination.
- B. Lesser Risk Pesticides: Materials listed on the U.S. National Organic Program's Final Rule, US Code of Federal Regulations 7CFR 205, list of acceptable materials and as follows:
1. Crawling insects: Boric acid based or plant based pesticides.
 - a. Botanical pesticides: Pyrethrum, neem formulations, rotenone, and others as approved by Owner.
 2. Rodents: Vitamin D3 (Cholecalciferol) or Quintox.

PART 3 - EXECUTION

3.1 NON-CHEMICAL PEST MANAGEMENT

2. Mechanical Controls
 - a. Traps:
 - 1) Rodents: Trapping devices shall be the standard method for indoor rodent control. All such devices shall be concealed out of the general view and in protected areas so as not to be affected by routine cleaning and other operations.
 - b. Vacuums:
 - 1) Insects: Portable vacuums shall be the standard method for initial cleanouts of cockroach infestations, ants, termites, and for control of spiders in webs.
3. Biological Controls:
 - a. Lady bugs, nematodes, and other biological controls: Permitted only for control of exterior ants, aphids, and/or other insects as appropriate. Coordinate with Section 32 90 00 (02900) – Planting.

3.2 CHEMICAL PEST MANAGEMENT

- A. Chemical Controls: Unless otherwise approved by Owner, Contractor shall use non-chemical methods of control. When pesticide use is necessary, the Contractor shall employ the least risk, NOP-listed pesticide; most precise application technique; and minimum quantity of pesticide necessary to achieve control.
- B. Bait Boxes: Bait boxes shall be maintained with an emphasis on the safety of non-target organisms.
1. Bait boxes shall be placed out of the general view, in locations where they will not be disturbed by routine operations.
 2. Lids shall be securely locked or fastened shut.
 3. Bait boxes shall be securely attached or anchored to floor, ground, wall, or other immovable surface, so that the box cannot be picked up or moved.
 4. Bait shall be secured in the feeding chamber of the box and never placed in the runway or entryways of the box.

5. Bait boxes shall be labeled on the inside with the Contractor's business name and address, and dated by the Contractor's technician at the time of installation and each servicing.

3.3 PEST REMOVAL

- A. Pest Removal: Remove traps, bait boxes, and their contents according to the approved IPM Plan and as requested by Owner.

END OF SECTION

SECTION 313 31 16 - TERMITE CONTROL GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See Rodent Control Specification

1.2 SUMMARY

- A. This Section includes the following for termite control:
 - 1. Soil treatment.

1.3 DEFINITIONS

- A. EPA: Environmental Protection Agency.
- B. PCO: Pest control operator.

1.4 SUBMITTALS

- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.

- E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. **Applicator Qualifications:** A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
- B. **Regulatory Requirements:** Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. **Environmental Limitations:** To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.7 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.8 WARRANTY

- A. **General Warranty:** Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. **Warranty Period:** Five years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- A. **Continuing Service:** Provide a proposal for continuing service, including monitoring, inspection, and retreatment for occurrences of termite activity, from applicator to

Owner, in the form of a standard yearly (or other period) continuing service agreement, starting one year after the date of Substantial Completion. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AgrEvo Environmental Health, Inc.; a Company of Hoechst and Schering, Berlin.
 - 2. American Cyanamid Co.; Agricultural Products Group; Specialty Products Department.
 - 3. Bayer Corp.; Garden & Professional Care.
 - 4. DowElanco.
 - 5. FMC Corp.; Pest Control Specialties.
 - 6. Zeneca Professional Products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as

wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
 - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 - 4. Masonry: Treat voids.
 - 5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. **After project landscaping is complete, contractor shall retreat the entire perimeter of building foundation.**

- D. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- E. Post warning signs in areas of application.
- F. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 02361

SECTION 31 62 00 - DRIVEN PILES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The extent of the work for the piling is shown on the Drawings including number and location.
- B. The work includes furnishing and driving required piling. The layout will be by the General Contractor.
- C. This section includes:
 - 1. Treated timber piling (Southern Pine) of ASTM D25 quality.
 - 2. Job piles.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Related Sections:
 - 1. Division 01 Section: Quality Requirements
 - 2. Division 01 Section: Testing Laboratory Services
 - 3. Division 31 Section: Earthwork

1.4 DAMAGE TO EXISTING PROPERTY

- A. Contractor shall investigate the existing adjacent buildings, sewers, and utilities and shall take proper and necessary precautions to protect same from damage due to the execution of the piling work. Should damage occur due to Contractor's negligence, the cost and responsibility for repairing or replacing the work in its original condition shall be borne by the Contractor at no cost to the Owner.
- B. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Provide photographs of conditions that might be misconstrued as damage caused by pile driving. Photographs must be of quality and detail to clearly document all pre-existing conditions of the adjacent structures and improvements with respect to structural foundations, building cracking/shifting, or other pre-existing conditions. Following approval from the Project Owner, the Contractor shall request adjacent property owner's authorization to photograph exterior and interior pre-existing conditions. Exterior photographs must be documented with vegetation and other visual barriers avoided. Photographs to be taken behind vegetation and barriers with appropriate detail and lighting control to view conditions clearly. All photographs must have "date imprint" visible on photographic image to verify date of recording.
- C. All damages to existing facilities or any other damage resulting from the piling operation must be repaired or renewed by the Contractor without cost to any other party.
- D. The project survey information shall not preclude the Contractor from performing the required investigative work prior to driving operation to verify clearance from underground utilities.

1.5 NOTIFICATION

- A. Contractor shall notify Architect forty-eight (48) hours prior to driving the initial pile. Pile driving must not commence without the Architect's notification and the testing laboratory being present. Engineer shall be contacted with driving data after the installation of the first job pile, prior to proceeding with additional piles. Direction on how to proceed will be given at that time.
- B. Regulatory Agency: In accordance with the applicable Building Code, the Contractor shall notify the Director of the responsible regulatory agency at least 24 hours in advance of pile driving.

1.6 SUBMITTALS

- A. General: Submit the following in accordance with Division 1 Section: Submittal Procedures.
 - 1. Driving Equipment: Descriptive data for hammer and other accessory equipment.
 - 2. Timber pile sketch indicating tip elevation and tip/butt dimensions.
 - 3. Preservative Treatment.
 - 4. Brush coat preservative treatment at cut-offs.
 - 5. Documentation of existing conditions for record only
 - 6. Numbered Pile Plan

1.7 PROJECT CONDITIONS

- A. No payment will be made for rejected piles, imperfect piles, or piles damaged in driving or handling.
- B. Site Information: Data for subsurface conditions is available through the Owner and is not intended as a representation or warranty of continuity of conditions. It is expressly understood that the Owner, the Architect, and the Architect's consultants will not be responsible for interpretations or conclusions drawn by Contractor from the data, which is made available for the information and convenience of Contractor. Soil borings or other geotechnical investigations may be performed by the Contractor with Architect's approval.
- C. Protection: Protect structures, utilities, and other improvements and construction from damage caused by pile driving operations.
- D. Control: Establish surveyed elevation benchmarks on structures where directed by Architect before commencing work when structures are within 10-feet of pile driving operations. Record and report elevation of each benchmark at least twice a day while pile driving is in progress and at completion of driving. If benchmark readings indicate displacement, halt driving operations until corrective action has been provided and is acceptable to Architect.

1.8 TEST PILE PROGRAM

- A. Probe piles shall be installed at non-permanent locations where directed by the Architect. Refer to the structural drawings for quantities.
- B. The Architect shall select which probe pile is to be load tested in accordance with ASTM D 1143 to verify the design capacity noted on the drawings (factor-of-safety = 2.0). Piles shall be loaded to 3x design capacity or failure, whichever occurs first.

PART 2 – PRODUCTS

2.1 TYPE OF PILES

- A. Piles shall be Southern Pine treated timber of ASTM D25 quality. Job piles shall not be ordered until the results of the load tests have been reviewed by the Architect.

2.2 MATERIALS

- A. Piles: Southern Pine conforming to ASTM D 25 "Specification for Round Timber Pile", with dimensions as follows:
 - 1. Minimum tip diameter = 8".
 - 2. Minimum butt diameter = 12" measured 3'-0" from the end.
 - 3. Tip Elevation: Tip shall be installed to 55'-0" below existing grade or refusal, whichever occurs first. Provide extra length above cut-off elevation for testing and driving.
 - 4. Preservative Treatment: Comply with AWPA Standards C1 and C3 for foundation piles using chromated copper arsenate (CCA) with a minimum wet retention of .80 lbs. per cu. foot. Testing of retention by the gauge method will be acceptable.
 - 5. Brush Treatment: Comply with WPA M4 and P9.
 - 6. Identification: Every treated pile shall be identified in accordance with AWPA M1 by branding or aluminum tag.
 - 7. Pile Length Markings: Mark each pile with horizontal lines at 1'-0" intervals, and the number of feet from pile point at 5'-0" intervals.

2.3 DRIVING EQUIPMENT

- A. General: Provide pile driving equipment of type generally used in standard pile driving practice, operated at manufacturer's specified rate, to develop required rated energy per blow.
- B. Hammer: Vulcan 01 delivering 15,000 FT/LB of energy per blow with refusal established as 25 blows per foot (@3 ft. stroke) with at least 40 ft. of embedment.
- C. Driving Procedure: Driving shall be done with fixed leads that shall hold the pile firmly in position and in alignment with the hammer. The butt of each timber pile before driving shall be cut at right angles to the longitudinal axis of the pile. The top of the pile shall be protected with a standard steel hood or similar type device, which will prevent damage to the pile during driving. Driving of each pile shall progress continuously until proper penetration is obtained or until refusal.
- D. Pre-punch: steel spud, 6" diameter maximum x 5 ft. long maximum.
- E. Accessory Equipment: Provide necessary accessory equipment suitable for the pile types and driving conditions involved.
- F. Location: Piles shall be driven plumb and accurately into positions shown on the Drawings. A maximum variation not exceeding 3" will be accepted as fulfillment of Contract.

PART 3 – EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to Project site in such quantities and at such times to ensure continuity of pile driving operations.
- B. Storage: Store piles in orderly groups above ground and blocked to prevent distortion of piles.
- C. Handling: Handle piles carefully without dropping, breaking, or abrading the surface. Repair damage or replace with new material.
 - 1. Brush treat all cut or damaged surfaces of treated piles, including the tops of piles after cut-off. Treatment complying with AWPA M4 and P9 to fill all shakes and splits and thoroughly penetrate the cut surfaces.

3.2 DRIVING

- A. Driving Equipment: All driving equipment shall be subject to the Architect's review, and if at any time, in the Architect's opinion, does not perform its intended task adequately, it shall be rejected.
- B. Hammer: Vulcan 01 hammer delivering 15,000 FT/LB of energy per blow.
- C. Driving Procedure: Driving shall be done with fixed leads that shall hold the pile firmly in position and in alignment with the hammer. The butt of each timber pile before driving shall be cut at right angles to the longitudinal axis of the pile and shall be taper trimmed. The top of the pile shall be protected with a standard steel hood or similar type device, which will prevent damage to the pile during driving. Driving of each pile shall progress continuously until proper penetration is obtained. Should refusal be reached prior to reaching the specified tip embedment or some other reason occurs to prevent such driving, pile driving operations shall be terminated, and the Architect shall be notified at once. A follower shall not be used.
- D. Location: Piles shall be driven plumb and accurately into positions shown on Drawings. A maximum variation not exceeding 3" will be accepted as fulfillment of contract. Should the variation from true center exceed the above, the piles in each cluster shall be plotted by the Contractor and the center of gravity of said cluster determined. If required, sufficient piles shall then be added at locations determined by the Architect. Contractor shall, at his own cost, drive such additional piling and/or alter pile caps as may be required to compensate for or to rectify the conditions brought about by failure to preserve proper spacing, whether this defect is discovered before or after the conclusion of driving.
- E. Over-Driving: Any piles driven too low to permit proper cut-off or load test must be corrected without extra charge. Any pile, which is damaged, defected, or broken, or any pile which cannot be driven to proper tip penetration because of interference by stumps or other underground obstructions, shall be immediately removed and replaced with an acceptable substitute pile at the location determined by the Architect. Solidly fill spaces left by withdrawn piles that will not be filled by new piles using cohesion less soil material such as gravel, broken stone, and gravel-sand mixtures. Place and compact throughout length of space in lifts not exceeding 6-feet. In the event that such removal should prove impossible the defective pile shall be abandoned and a suitable pile shall be driven close to the worthless one, where the Architect directs. Payment will be made to the Contractor in accordance with the terms of the contract unless the defect is due to the Contractor's negligence.
- F. General: Continuously drive piles at locations indicated to the noted tip elevation below existing grade or refusal. Notify Architect immediately if refusal is reached above the indicated tip elevation.
 - 1. Take special precautions to ensure against overstress or leading away from a true plumb position when driving.
 - 2. When high resistant strata lying near the surface must be penetrated, spud piles (8" maximum diameter) may be used to minimize hard driving during early stages of driving operations. 10'-0" penetration maximum.
 - 3. Jetting will not be permitted.
- G. Driving Tolerances: Drive piles within following maximum variance.
 - 1. Maintain 1 inch in 10 feet from vertical, or a maximum of 3 inches.
- H. Corrections for Misdriven Piles: If variations exceed the tolerances specified above, unless limiting and controlling conditions as determined by the Architect make it impossible to maintain positions

more accurately, the Contractor shall furnish and drive additional piles and/or modify foundation construction as instructed by the Architect, without additional cost to the Owner.

- I. Pile driving operations shall immediately be terminated, and the Architect contacted, if sustained vibrations exceed .25 in/sec.
- J. Heaved Piles: Provide recorded instrument observations made during pile driving to determine whether driven pile has lifted from its original seat during driving of adjacent piles. Notify Architect if movement has occurred. Heaved piles requiring re-seating with the specified hammer.
- K. Damaged Piles: Damaged piles will not be accepted. Any pile which is damaged, broken or deflected, or which cannot be driven to required penetration because of underground obstructions, shall be rejected.
- L. Over-Driven Piles: Any piles driven too low to permit proper load testing shall be corrected without additional cost to the Owner, as instructed by the Architect.
- M. Cutting-Off: Cut-off tops of driven piles on a horizontal plane. Dispose of excess materials off site.

3.3 CUT OFF

- A. Piles shall be cut-off on a neat horizontal plane and the cut-off portions shall be removed from the job site. No additional Contract time or compensation will be allowed regardless of cut-off lengths.
- B. Treat tops of treated timber piles, after cut off, with 2 brush coats in accordance with AWWA requirements.

3.4 FIELD QUALITY CONTROL

General: The testing laboratory shall perform the following tests and submit test reports.

All piles shall be plant inspected prior to driving (for ASTM D25 quality and preservative treatment retention and type) and shall be hammer marked or aluminum tagged on the butt to indicate conformance with requirements of these specifications.

- A. Log the driving of all piling. Recording the date driven, type of hammer, pre-punch diameter, pre-punch depth, pile description, including actual tip, length and butt dimension as measured immediately prior to driving, and driving resistance with blows per foot for all length of the pile. Driving records shall be submitted daily.
- B. Continuously measure vibrations at two locations directed by Architect with a seismograph during all pile driving operations to prevent damage to adjacent structures or utilities. For sustained peak particle velocity levels in excess of .25 an inch per second, pile driving operations shall be terminated and the Architect advised.
- C. Pile numbering plan.

END OF SECTION 31 62 00

SECTION 31 31 13 – RODENT CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Integrated Pest Management (IPM) to address the following pests:
 - 1. Indoor populations of rodents, insects (including termites), arachnids, and other arthropods.
 - 2. Outdoor populations of potentially indoor-infesting species that are within the property boundaries.
 - 3. Nests of stinging insects within 20 (twenty) feet of the building and within the property boundaries.
 - 4. Individuals of all excluded pest populations that are incidental invaders inside the building.
 - a. Excluded Pest Populations:
 - 1) Birds, bats, snakes, and all other vertebrates other than commensal rodents.
 - 2) Pests that primarily feed on outdoor vegetation.
- B. Integrated Pest Management (IPM) shall include the following:
 - 1. Initial building and site inspection.
 - 2. Developing an IPM Plan appropriate to the building, site, and local ecosystems.
 - 3. Implementing the approved IPM Plan.
 - 4. Documenting IPM services.
- C. Related Sections:
 - 1. Termite Control

1.2 DEFINITIONS

- A. Definitions pertaining to sustainable development: As defined in ASTM E2114.
- B. Action Threshold: The level at which action is initiated as determined by how many pests can be tolerated.
 - 1. The action threshold reflects the pest management objective for the site. The presence of some pests does not, in itself, necessarily require action. When pest populations exceed established action thresholds, action must be taken.
- C. Biological Control: The use of living organisms—parasites, predators, or pathogens—to maintain pest populations.
- D. Cultural Control: The manipulations of the site ecosystem that make it less friendly to the establishment and proliferation of pest populations.
- E. Exclusion: The practice of structural and procedural modifications to reduce access used by pests.
- F. Integrated Pest Management (IPM): An approach to pest management that uses current, comprehensive information on the life cycles of pests and their interactions with the environment to identify and implement effective methods of pest control with the least possible hazard to people, property, and the environment.
- G. Mechanical Control: The use of one or more physical components of the environment, such as temperature, humidity, or light, to the detriment of the pest.

SECTION 31 80 00 - STORM WATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This work consists of obtaining proper permits and construction and maintenance of erosion control and management control features as described in these Drawings and Specifications for the clearing and grading and facility construction of the proposed site.
- B. The Storm Water Pollution Prevention Plan includes:
 - 1. Certification of compliance
 - 2. LPDES Notice of Intent (NOI)
 - 3. Erosion and Sediment Controls
 - 4. Other Controls
 - 5. Stormwater Management Controls
 - 6. Inspection and Maintenance of Controls
 - 7. Records of Construction Activities
 - 8. LPDES Notice of Termination (NOT)
- C. Related Sections include the following:
 - 1. Division 1 Section "Field Engineering" for verifying utility locations and for recording field measurements.
 - 2. Division 1 Section "Temporary Facilities" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
 - 3. Division 2 Section "Earthwork" for excavation in borrow areas and stockpiling materials, removal of unsuitable material and for foundation preparation and construction of embankments and another incidental earthwork.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Erosion and Sediment Controls
 - 1. Temporary Seeding: Temporary seeding shall be in accordance with Section 717 of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition.
 - 2. Fertilizer: Fertilizer shall be in accordance with Section 718 of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition.
 - 3. Mulch: Mulch shall be in accordance with Section 1018.19 of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition.
 - 4. Silt Fencing: Silt fencing shall be in accordance with Section 204.03(e) of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition.
 - 5. Hay Bales: Hay bales shall be secured in place with a minimum of two wooden stakes as indicated.
- B. Other Controls
 - 1. Stabilized Construction Entrance: Stabilized construction entrance shall be of limestone material conforming to Section 1003.04(a) of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Certification of Compliance:
 - 1. Contractor and Sub-contractors shall sign the Certification of Compliance included with this specification and submit to the Parish of West Baton Rouge Public Works Department.
- B. LPDES Notice of Intent (NOI):
 - 1. Contractor shall complete and submit the "LPDES Notice of Intent (NOI) to Discharge Stormwater Associated with Construction Activity" to the State of Louisiana - Department of Environmental quality, Certified Mail.
A copy of this document, with copy of certified mail receipt, shall also be submitted to the Parish of West Baton Rouge Public Works Department.
- C. LPDES Notice of Termination (NOT):
 - 1. Contractor shall complete and submit the "LPDES Notice of Termination (NOT) of Coverage Under LPDES General Permit for Stormwater Discharges Associated with Construction Activity" to the State of Louisiana Department of Environmental Quality, Certified Mail. A copy of this document, with copy of certified mail receipt, shall also be submitted to the Parish of West Baton Rouge Public Works Department

3.02 FIELD PROCEDURES

- A. Erosion and Sediment Controls
 - 1. Erosion and Sediment Controls for this project will include temporary seeding (and mulching where required) of all disturbed areas, silt fencing and check dams as indicated. These measures are to be used for erosion and sediment controls throughout the time of construction. Temporary seeding and fertilizer shall be executed in accordance with Sections 717 and 718, respectively, of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition. Silt fencing and check dams shall be executed in accordance with Section 204.07 of the Louisiana Standard Specifications for Roads and Bridges, 1992 Edition. Locate and clearly flag trees and vegetation to remain or to be relocated.
 - 2. Perimeter silt fending shall be erected immediately and prior to any clearing and grading activities. Construction of controls and stabilization measures shall be by personnel experienced and/or adequately trained in this type of installation
- B. Other Controls:
 - 1. In addition to erosion and sediment controls, the Contractor shall be responsible in addressing other potential pollutant sources on the construction site, which may include compliance with applicable State and Parish waste disposal, control of offsite vehicle tracking, and control of dust generated by construction activities. A stabilized construction entrance shall be installed as indicated.
- C. Inspection and Maintenance of Controls:
 - 1. Contractor shall inspect controls every 7 days or within 24 hours of a storm of 0.5 inches in depth. All disturbed areas of the site, areas of material storage, and all the erosion and sediment controls should be inspected. Controls must be in good operating condition until the area they protect has been completely stabilized and the construction activity is complete.
 - 2. During each inspection, the contractor should complete the stabilization or structural measures inspection report form, included in this Specification and note any damages or deficiencies.

- D. Records of Construction Activities:
1. Contractor shall keep records of the construction activity on-site. Records shall include, but not limited to:
 - All completed inspection report forms.
 - Dates of major grading activities in all areas of the site.
 - Dates of stabilization of all areas of the site.
 2. A copy of the Stormwater Pollution Prevention Plan must be kept at the construction site from the time construction begins until the site is finally stabilized.
 3. The Contractor shall retain copies of the Stormwater Pollution Prevention Plan and all other reports required by the permit, as well as all the data used to complete the NOI for 3 years after the completion of final site stabilization.
- E. Report Releases of Reportable Quantities:
1. Contractor shall have the responsibility to report spills of hazardous substances in amounts that equal or exceed Reportable Quantity (RQ) levels in accordance with EPA regulations (40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302). If there is a RQ release during the construction period, the contractor must take the following minimum steps:
 - Notify the National Response Center immediately at (800) 424- 8802.
 - Submit a written description of the release to the EPA Regional Office providing the date and circumstances of the release and the steps to be taken to prevent another release.

END OF SECTION 31 80 00

DIVISION 32
EXTERIOR IMPROVEMENTS

SECTION 32 13 13 - CEMENT CONCRETE PAVEMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
Revise below to suit Project.
 - 1. Driveways, parking areas.
 - 2. Curbs.
 - 3. Walkways & patios. (Do not use fly ash in courtyard paving)
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
 - 2. Division 7 Section "Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 – PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- E. Tie Bars: ASTM A 615, Grade 60, deformed.
- F. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I
 - 1. Fly Ash: Use of fly ash is not permitted in courtyard paving. Permitted in all other paving.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4
 - 2. Maximum Aggregate Size: 1-1/2 inches nominal.
 - 3. Aggregate Type: River Rock
 - 4. Do not use fine or coarse aggregates containing substances that cause spalling.

- D. Exposed Aggregate:
 - 1. Maximum Aggregate Size: 1/2 inch nominal.
 - 2. Aggregate Type: Angular rock (smooth rounded pea gravel not acceptable).
- E. Aggregate for Concrete Pavement with Exposed Aggregate: Selected, hard, and durable; washed; free of material that reacts with cementitious material or causes staining; from a single source.
 - 1. Maximum Aggregate Size: 1/2 inch nominal.
 - 2. Aggregate Type: Angular rock (smooth rounded pea gravel not acceptable).

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Colored Admixtures:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - a. Scofield Systems – “Chromix”
 - b. Solomon Colors – “Liquid ColorFlo”
 - c. Davis Colors
 - 2. Color: To be chose from Manufacturer’s standard color range.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- E. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, the following:
 - 1. Clear Waterborne Membrane-Forming Curing Compound:
 - a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
 - b. Aqua Resin Cure; Burke Group, LLC (The).
 - c. Safe-Cure Clear; ChemMasters.
 - d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
 - e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
 - f. Nitocure S; Fosroc.
 - g. Aqua Kure-Clear; Lambert Corporation.
 - h. L&M Cure R; L&M Construction Chemicals, Inc.
 - i. 1100 Clear; W. R. Meadows, Inc.
 - j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
 - k. Rich Cure E; Richmond Screw Anchor Co.
 - l. Resi-Chem Clear Cure; Symons Corporation.
 - m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.

- n. Hydro Cure; Unitex.
- o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.

2.6 RELATED MATERIALS

- A. Expansion and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.
 - 1. Colors: Blue for handicapped requirements, red for fire lanes, white elsewhere.
Retain paragraph below with pavement markings above if reflective markings are required.
Delete paragraph and subparagraph below if not applicable. Revise concrete strength, configuration, and anchoring to suit Project.
- C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 CONCRETE MIXES

- A. See embedded documents
- B. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- C. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
- D. Typical Concrete: Proportion mixes according to ACI 211.1 and ACI 301 to provide normal weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi, and Flexural Strength (28 days) 600 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
- E. Special Mix: Integral colored concrete. Same strength as typical concrete at HC ramps and curb cuts, color: Terra Cotta, groove joints at 2.5" o.c.
- F. Add air-entraining admixture at manufacturer's prescribed rate.
- G. For concrete at "Concrete Pavement with Exposed Aggregate Mix" use a six bag mix.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 1. Provide preformed galvanized steel keyway-section full depth of concrete, with removable plastic sealant dap cap .
 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 3. Provide tie bars at sides of pavement strips where indicated.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 1. Locate expansion joints at intervals of 48 feet, unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler less than 1/2 inch or more than 3/4 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for, as follows:
 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/8-inch- wide, 1/2-inch deep joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks. Cut joints not less than 4 - 6 hours after pouring.
 2. Tooled Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4 inch wide by 1/2 inch deep. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces. Joint spacing in sidewalks no more than 1.5 x width of sidewalk.
 3. For location of joint types see Drawings.
Edging is included in this Article for its similarity to jointing. Timing of edging after initial floating is critical.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
 1. Radius: 1/4 inch.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- C. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- E. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- F. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- G. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- H. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- I. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven trowel, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture with power driven trowel.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
2. At all handicap ramp curb cuts provide a broom finish and install truncated dome mats or tiles, embedded, as shown, full width and depth of ramp.

3.7 SPECIAL FINISHES

A. Monolithic Exposed Aggregate Finish: Apply exposed aggregate to pavement surfaces as follows:

1. Immediately after floating, broadcast angular gravel.
2. Lightly tamp angular gravel into concrete paving (for bonding purposes only). Leave angular gravel 60% exposed.
3. Fine-spray surface with water to remove cement film from exposed aggregate surfaces.
4. Remove excess mortar, and any remaining mortar film from face of boulders.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing

operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- 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. Cold-applied joint sealants.
 - 2. Hot-applied joint sealants.
 - 3. Cold-applied, fuel-resistant joint sealants.
 - 4. Hot-applied, fuel-resistant joint sealants.
 - 5. Joint-sealant backer materials.
 - 6. Primers.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Paving-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.

1.05 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.02 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crafcro Inc.
 - b. Dow Corporation
 - c. Pecora Corporation.

2.03 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.04 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.02 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.04 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

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

3.05 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.

1. Joint Location: all parking lot joints.
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving,
 - c. Other joints as indicated.
2. Joint Sealant Single-component, self-leveling, silicone joint sealant
3. Joint-Sealant Color: Gray.

END OF SECTION 32 13 73

SECTION 32 17 13 - PARKING BUMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes wheel stops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Samples for Initial Selection: For each type of exposed finish requiring color selection.
- D. Samples for Verification: For wheel stops, 6 inches, showing color and cross section; with fasteners.

PART 2 – PRODUCTS

2.1 PARKING BUMPERS

- A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 4000 psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
 - 1. Surface Appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
 - 2. Mounting Hardware: Galvanized-steel hardware as standard with wheel-stop manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

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- A. General: Install wheel stops according to manufacturer's written instructions unless otherwise indicated.
- B. Install wheel stops in bed of adhesive before anchoring.
- C. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 32 17 13

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing painted traffic markings as shown on the Drawings.
- B. Details not shown on the Drawings shall be in conformity with the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD).
- C. This WORK shall also include re-stripping all paint markings to their original conditions, if damaged by the Contractor's operations.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. All traffic paint shall either be quick dry alkyd or water-based traffic paint complying with subsection 1015.12 of the LADOTD standard specifications.
 - 1. Blue marking paint shall conform to latest MUTCD.

PART 3 - EXECUTION

3.01 GENERAL

- A. Lines shall be applied as solid, dashed or dotted stripes, either singly or in combination, as shown on the Drawings. Dashed lines shall be applied in a 40-foot cycle consisting of a ten-foot dash and a 30-foot gap between dashes, unless otherwise shown on the Drawings. The CONTRACTOR shall use an accurate dashing mechanism, which is capable of being easily adjusted to retrace existing dashed markings or to apply new materials at the correct spacing. Dashed lines which are to be applied over plainly visible existing dashed lines shall begin within six inches of the beginning of the existing dash, unless otherwise directed by the ENGINEER
- B. Gaps not marked because of template use for spray-applied auxiliary markings shall be filled with marking material after template removal.
- C. Pavement markings shall be free of uneven edges, overspray, or other readily visible defects which detract from the appearance or function of the pavement markings.
- D. Lines shall be sharp, well defined, and uniformly retroreflective as required. The width of the applied shall be the width specified plus or minus 1/4-inch. Fuzzy lines, excessive overspray, or non-uniform applications are unacceptable. Lines shall be inspected at night by the ENGINEER to verify effective light reflection. Pavement markings which are improperly applied, located, or reflectorized shall be corrected. Lines applied with insufficient material quantities shall be properly reapplied. Improperly located lines shall be removed. New lines shall then be applied in the correct locations at the Contractor's expense, including the furnishing of approved materials.

E. Methods and equipment used for pavement preparation, marking removal shall be subject to the approval of the ENGINEER.

F. Other construction WORK, such as shoulder paving, topsoil placement and grading, and seeding, shall be scheduled and performed in a manner to avoid damage to applied pavement markings.

G. Pavement marking materials shall not be applied to the reflector of a recessed pavement marker. The CONTRACTOR shall interrupt the application of the pavement marking line at each recessed pavement marker where marking material would otherwise be applied to the marker prismatic reflector. The maximum gap in the marked line at each marker shall be 18- inches. Pavement marking material applied to a prismatic reflector surface shall be removed by the CONTRACTOR, or the reflector shall be replaced at his expense the same working day. When the CONTRACTOR must most remove material from the reflector, the reflector's brightness shall be restored to its prior condition.

3.02 PAVEMENT PREPARATION

A. The CONTRACTOR shall clean all visible loose or foreign material from the surface to be marked. The pavement marking equipment shall be equipped with an air jet to remove all debris from the pavement in advance of the applicator gun. The air jet shall operate when marking material is being applied and be synchronized with marking material application.

B. Pavement markings shall be applied only when the surface is clean and dry. The CONTRACTOR shall power broom clean all surfaces where edge lines are to be applied. When required by the ENGINEER, other surfaces shall also be power broom cleaned.

C. Marking shall not be applied to Portland cement concrete until the concrete in the areas to be marked is clean of membrane curing material and is dry.

3.03 LAYOUT AND PREMARKING

A. The CONTRACTOR shall lay out the locations of all lines, words and other symbols to assure their proper placement. The layout and premarking lines shall be approved by the ENGINEER before marking operations are started. When applying longitudinal or transverse lines, the CONTRACTOR shall use existing lines, construction joints or premarking to guide this marking equipment.

B. Premarking shall be located from survey data or reference points and offset so as to parallel the theoretical edge of the marking lines at a maximum distance of one inch. Templates are required for the layout of arrows, words and other symbols. Premarking for longitudinal lines shall be placed at 40-foot intervals and shall not exceed two inches in width or 12 inches in length. Premarking for auxiliary markings shall be located as shown on the Drawings or schematic forms provided by the ENGINEER

3.04 LINE PLACEMENT TOLERANCES

A. Pavement marking lines shall be straight or smoothly curved, true to the alignment of the pavement, and shall not deviate laterally from the proper location at a rate of more than two inches in 100 feet No deviation greater than three inches will be permitted.

3.05 LINE TYPES

- A. Marking materials shall be applied at a minimum rate of 16.5 gallons per mile per four-inch-wide stripe, with a 20-mill minimum thickness. The minimum rate of application for broken traffic stripes shall be prorated.
- B. Edge lines shall be continuous stripes, four inches in width. Center of stripe shall be located as shown on the Drawings.
- C. Lane lines shall be four-inch-wide white stripes between contiguous lanes of pavement carrying traffic in the same direction. They shall be dashed unless specified solid. They shall be offset to the left of the longitudinal joint, if present, or the theoretical line lying between contiguous lanes, if a joint is not present the nearer edge of the stripe shall be two inches to the left of the joint or line.
- D. Centerlines shall be single or double yellow stripes between contiguous lanes of pavement carrying traffic in opposite directions. Each stripe shall be four inches wide, solid or dashed.
- E. Stop lines shall be solid white strips, 24-inches wide. Crosswalk lines shall be solid white strips, 24 inches wide.
- F. Parking lot stall marking lines shall be continuous white stripes, four inches in width.
- G. Lane arrows and letters shall be white markings, with a minimum rate of application of 0.01 gallon per square foot of markings.

3.06 EQUIPMENT AND APPLICATION OF PAINTED TRAFFIC MARKINGS

- A. The markings shall be applied by machine methods acceptable to the ENGINEER. The paint machine shall be of the spray type capable of satisfactorily applying the paint under pressure with uniformity of feed through nozzles spraying directly upon the pavement. Each machine shall can apply two separate stripes, either solid or skip, at the same time. Each paint tank shall be equipped with a mechanical agitator. Each nozzle shall be equipped with satisfactory cutoff valves which will apply broken or skip lines automatically. Each nozzle shall have a mechanical bead dispenser that will operate simultaneously with the spray nozzle and distribute the beads in a uniform pattern at the rate specified. Each nozzle shall also be equipped with suitable line guides consisting of metallic shrouds or air blasts.
- B. The paint shall be thoroughly mixed prior to application, and shall be applied when the air temperature is above 40° F and rising, to a clean and dry surface
- C. The painted area shall be protected from traffic until the paint is thoroughly dry.

3.07 REMOVAL OF PAVEMENT MARKINGS

- A. When indicated on the Drawings, pavement markings shall be removed. The markings shall be removed by high-pressure water blast, sand blast, high temperature burning with excess oxygen, or other methods, with the approval of the ENGINEER Care shall be exercised during marking removal not to scar, discolor or otherwise damage the pavement surface. Overpainting or other methods of covering markings in lieu of removal shall not be permitted.

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END OF SECTION 32 17 23

SECTION 32 31 13 PVC COATED CHAIN LINK FENCE

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Poly Vinyl Chloride (PVC) coated chain link fabric with PVC color coated galvanized steel framework and accessories for commercial or industrial applications.
- B. This section also applied to chain link fencing without vinyl coating – see plans for locations of vinyl coated and galvanized fencing.

1.02 RELATED SECTIONS

- 01 33 00 Submittals for Shop drawings, product data
- 03 30 00 Cast-In-Place Concrete

1.03 REFERENCES

- A. ASTM A36 Standard Specification for Carbon Structural Steel
- B. ASTM F552 Standard Terminology Relating to Chain Link Fencing
- C. ASTM F567 Standard Practice for Installation of Chain Link Fence
- D. ASTM F626 Standard Specification for Fence Fittings
- E. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric
- F. ASTM F900 Standard Specification for Industrial and Commercial Swing Gates
- G. ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials
- H. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
- I. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates
- J. ASTM F1664 Standard Specification for Polyvinyl Chloride (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used With Chain Link Fence
- K. ASTM F1665 Standard Specification for Polyvinyl Chloride (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain Link Fence
- L. ASTM F1910 Standard Specification for Long Barbed Tape Obstacles
- M. ASTM F1911 Standard Practice for Installation of Barbed Tape
- N. ASTM F2200 Standard Specification for Automated Vehicular Gate Construction
- O. WLG2445 Chain Link Fence Manufacturers Institute, Chain Link Fence Wind Load Guide for the Selection of Line Posts and Line Post Spacing

1.04 SUBMITTALS

- A. Shop drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
- B. Product data: Manufacturer's catalog cuts indicating material compliance and specified options.
- C. Samples: If requested, samples of materials (e.g., fabric, wires, color, and accessories).

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company having manufacturing facilities in the United States with 5 years experience specializing in manufacturing of chain link fence products.
- B. Fence contractor: Contractor having 7 years' experience installing similar projects in accordance with ASTM F567.
- C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.
- D. Substitutions: Alternate chain link products may be acceptable by the architect as equal if approved in writing ten days prior to bidding provided that the items submitted meet the specifications contained in this document.
- E. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.

PART 2 - PRODUCTS

2.01 MANUFACTURER

Basis of Design: Master Halco, Inc., One City Blvd. West, Suite 900, Orange, CA 92868
Phone (800) 229-5615 Fax (714) 385-0107

2.02 CHAIN LINK FENCE FABRIC

- A. Poly Vinyl Chloride (PVC) color coated steel chain link fabric per ASTM F668 Class 2b fused and adhered to metallic coated steel wire.
- B. Size and Height: Chain link fabric 2 in. mesh, 9 gauge (9 gauge before vinyl application)
- C. Selvage of fabric knuckled at top and at bottom for 4' & 6' ht. See locations on plans for barbed angles at perimeter fencing.
- D. Color of chain link fabric per ASTM F934 – **Color: Black.**

2.03 PVC COLOR COATED STEEL FENCE FRAMEWORK Dark green or black as selected by architect.

- A. Steel pipe Type I: ASTM F1043 Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz/ft² (550 g/m²) on the outside and 1.8 oz/ft² (550 g/m²) on the inside surface. Exterior of pipe to have F1043 PVC thermally fused color coating, minimum thickness 10 mils (0.254 mm).
- B. Grade: Steel Pipe shall be Schedule 40 Steel Pipe High Strength Grade (50,000 psi).

- C. Structural Performance: Chain-link fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:
1. **Minimum Post Size: Standard wt. sch. 40, hot dipped galvanized. For framework up to 12 feet high, and post spacing not to exceed 10 feet, dimensions in O.D.”.**
 - a. 4’ ht. 1 – 7/8” dia. line posts, 3” end posts.
 - b. 6’ ht. 2 ½” dia. line posts, 3” end posts.
 - c. Use 2 ½” posts at 8’ section of fencing under stairs at press box (see plans)
 2. **Top Rail Size:**
 - a. 4’ ht. fence: 1-7/8”
 - b. 6’ ht. fence: 1-7/8”
 3. **Minimum Line Post Hole Size (to bottom of post below grade): See fencing details in drawings for footing schedule, Sheet A2.13.**
 4. **Minimum Post Size and Maximum Spacing indicated above: Determine according to CLFMI WLG 2445, based on mesh size, and solid wood fence specified and on the following:**
 - a. Wind Loads: 150 mph.
 - b. Exposure Category: c.
 - c. Fence Height: 4’ & 6’.
 - d. Material Group: IA, ASTM F 1043, Schedule 40 steel pipe.
 5. **SEE SITE PLAN DRAWINGS AND DETAILS FOR CONDENSING UNIT ENCLOSURE. PROVIDE GATE HARDWARE WITH STRUCTURAL COMPONENTS DESCRIBED IN DRAWINGS.**

2.04 FITTINGS

- A. All fittings to be PVC thermally fused color coated having a minimum thickness of 0.006” (0.152 mm) per ASTM F626. PVC color to match fabric and framework. Moveable parts, nuts and bolts to be field coated with PVC liquid touch up after installation.
- B. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post.
- C. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.
- D. Top rail sleeves: 7” (178 mm) galvanized steel sleeve per ASTM F626.
- E. Wire ties: 9 gauge (0.148”) (3.76 mm) galvanized steel wire for attachment of fabric to line posts and rails. Pre-formed hog ring ties to be 9 gauge (0.148”) (3.76 mm) galvanized steel or aluminum for attachment of fabric to tension wire. Tie wire and hog rings PVC coated and in compliance with ASTM F626. Color to match fabric color.
- F. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105”) (2.67mm) pressed steel by 3/4” (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16” (7.94 mm) galvanized carriage bolt and nut.
- G. Tension (stretcher) galvanized steel bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16” x 3/4” (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.

- H. Truss rod assembly: Galvanized steel minimum 5/16" (7.9mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626
- I. Carriage bolts and nuts: Galvanized of commercial quality

2.05 TENSION WIRE

- A. Tension wire: Poly Vinyl Chloride (PVC) coated metallic coated steel tension wire per ASTM F 1664 9 gauge steel core wire, 0.148 PVC coating class and color to match chain link fabric

2.07 CHAIN LINK SWING GATES

- A. Swing gates size as indicated on plans.. Fabricate chain link swing gates in accordance with ASTM F900. Gate frame to be of welded construction. Weld areas to be protected with zinc-rich paint per ASTM A780 then over coated with liquid PVC to match frame. The gate frame members are to be spaced no greater than 8' 0" (2.44 m) apart horizontally or vertically. Exterior members to be 1.900" (48.3 mm) OD pipe, interior members when required shall be 1.660" (42.2 mm) OD pipe. PVC coated pipe to be per section 2.03. Chain link fabric to match specification of fence system. Fabric to be stretched tightly and secured to vertical outer frame members using tension bar and tension bands spaced 12" (304.8 mm) on center and tied to the horizontal and interior members 12" (304.8 mm) on center using 9 gauge galvanized steel ties per section 2.04.
- B. Hinges, hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad)
- C. Latch: Galvanized forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
- D. Double gates: Provide galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide galvanized pressed steel cargo locking latch, requiring one padlock for locking both gate leaves, accessible from either side.
- E. Keeper to secure open leafs: Provide galvanized gate hold back keeper for each gate leaf over 5' (1524 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- F. Latch, hinges, moveable parts may be field coated with liquid PVC.
- G. Gate posts: PVC color coated Grade 1 pipe ASTM F108] per section 2.03, see OD select gate post from table below]

Gate fabric height up to and including 6 ft.

Gate leaf width	Outside Diameter
up to 4 ft.	2.375 in.
over 4 ft. to 10 ft.	2.875 in.
over 10 ft. to 18 ft.	4.000 in.

2.09 POST SETTING MATERIALS

- A. Concrete: Minimum 28 day compressive strength of 3,000 psi. See sheet A2.13 for footing chart.

PART 3 EXECUTION

3.01 SITE EXAMINATION

- A. Ensure property lines and legal boundaries of work are clearly established.
- B. Survey of fence location to be provided by [G.C.](#)
- C. Verify areas to receive fencing are completed to final grade.
- D. Provide a detailed plan showing all fencing locations, post spacings, and mesh. The plan should also include gate locations and sizes. Provide product submittals for all fencing components. Fence work shall not begin until all fencing submittals are approved by the architect.

3.02 CHAIN LINK FRAMEWORK INSTALLATION

- A. Install chain link fence system in accordance with ASTM F567 and manufacturer's instructions.
- B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.
- C. Space line posts uniformly 8' – 10' o.c. or as required by manufacturer to meet the IBC wind ratings of [West Baton Rouge Parish](#).
- D. Concrete set posts: Dig holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6" (152 mm) deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts.
- E. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- F. Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6' (1829 mm) and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.
- G. Tension wire: Install tension wires so that it will be located 4" (101.6 mm) up from bottom the fabric. If top rail is not specified, install the tension wire so that it will be located 4" (101.6 mm) down from the top of the fabric. Stretch and Install tension wire before installing the chain link fabric and attach it to each post using wire ties.
- H. Top rail: Install in lengths of 21' (6.400 m). Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.

- I. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps for fences greater than 6'in ht.
- J. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps for 10' ht. basketball backstop, other fences to have tension wire at bottom..
- K. Touch up any nicks or scratches of the PVC color coating with liquid PVC paint.

3.04 CHAIN LINK FABRIC INSTALLATION

- A. Fabric: Install fabric on security side, pull fabric taut; thread the tension bar through fabric and attach to terminal posts with tension bands spaced maximum of 15" (381 mm) on center and attach so that fabric remains in tension after pulling force is released. Install fabric so that it is 2" (50 mm) +/- 1" (25 mm) above finish grade.
- B. Secure fabric using wire ties to line posts at 15" (381 mm) on center and to rails and braces 24" (610 mm) on center, and to the tension wire using hog rings 24" (610 mm) on center. Tie wire shall be secured to the fabric by wrapping it two 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude so as to avoid injury if a pedestrian may come in contact with the fence.

3.05 CHAIN LINK GATE INSTALLATION

- A. Swing gates: Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be [as shown on drawings](#). Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 6" (152 mm) diameter by 24" (610 mm) deep. Gate leaf holdbacks shall be installed on all double gates and all gate leafs greater than 5' (1524 mm) in width.
- B. Provide an allowance of (2) double gates, 8' wide (two 4' leafs) and 6' tall. Provide a line item in the schedule of values for the (2) double gate allowance.

3.07 ELECTRICAL GROUNDING

- A. Grounding when required shall be the responsibility of a licensed electrical contractor.

3.08 SITE CLEAN UP

- A. Clean up area adjacent to fence line from debris and unused material created by fence installation.
- B. Remove all remaining mesh and ties.
- C. Clean footings of debris and loose gravel/concrete debris/ and dirt.
- D. All grades around fence footings shall be contoured to match the grades in the adjacent areas and not disrupt water shed.

END OF SECTION 32 31 13

SECTION 32 90 00 – Lawn Sodding

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding.

1.2 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of grass seed.
 - 1. Certification of each seed mixture for turfgrass sod.
- C. Product certificates.

1.4 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
 - 1. The soil-testing laboratory shall oversee soil sampling.
 - 2. Report suitability of tested soil for turf growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

1.6 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 60 days from date of planting completion
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
2. Sodded Turf: 30 days from date of planting completion

PART 2 - PRODUCTS

2.1 SEED (not seeding in project)

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species as follows:
 1. Full Sun: Bermuda
 2. Sun and Partial Shade: Bermuda
- C. Grass Seed Mix: Proprietary seed mix as follows:
 - a. Products: Subject to compliance with requirements.

2.2 TURFGRASS SOD

- A. **Provide sod in the following areas:**
 1. **5' of sod around perimeter of new sidewalks and playground**
 2. **15' of sod around perimeter of new building**
 3. **15' of sod around new parking lot paving including landscape islands and larger islands in middle of new parking area.**

IT IS IMPORTANT THAT EXISTING SOILS ARE EXCAVATED DOWN TO ALLOW FOR THE THICKNESS OF SOD TO MEET FINAL GRADING. SOD PLACED ON TOP OF FINAL GRADING THAT OBSTRUCTS WATER FLOW OR CAUSES "HUMPS" ABOVE THE LEVEL OF NEW PAVING OR ENCROACHES ON THE BUILDING'S MASONRY WEEP LEVEL WILL NOT BE ALLOWED. FAILURES IN PROCEDURE WILL CAUSE THE CONTRACTOR TO REMOVE THE SOD AND REGRADE. THIS WILL BE NOTED ON THE PUNCH LIST WITH ASSIGNED VALUES TO CORRECT IT.

- B. Turfgrass Sod: Approved, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

C. Turfgrass Species: Sod of grass species as follows:

1. Full Sun: Bermuda
2. Sun and Partial Shade: Bermuda

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through [1-inch (25-mm)] sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.6 PLANTING SOILS

- A. Planting Soil Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

2.8 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches (100 mm) Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - 3. Spread planting soil to a depth of 4 inches (100 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least 6 inches (150 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches (100 mm) of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.

3. Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, trash, and other extraneous matter.
 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

- A. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of [2 lb/1000 sq. ft. (0.9 kg/92.9 sq. m)]
- C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of [2 tons/acre (42 kg/92.9 sq. m)] to form a continuous blanket [1-1/2 inches (38 mm)] in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- E. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of [3/16 inch (4.8 mm)] and roll surface smooth.

3.3 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted

soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.
 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.4 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.
- C. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.5 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm)
 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

END OF SECTION 02920-1

SECTION 32 91 20- LIME STABILIZATION

PART 1 - GENERAL

1.01 Related Items Specified Elsewhere:

- A. Grading – Section 312150
- B. Excavating, Backfilling and Compacting for Pavement – Section 312250

1.02 Description

This work consists of preparing subbase, furnishing and placing lime, and stabilizing subbase material in accordance with plan details and the material guidelines shown below. All work shall be performed in accordance with the provisions of Section 304 of the Louisiana Standard Specifications for Roads and Bridges, latest edition.

1.03 Applicable Publications.

The following publications, referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

Louisiana Standard Specifications for Roads and Bridges (2000 Edition), including amendments (LSSRB)

304 Lime Treatment

1018 Miscellaneous Materials

PART 2 - PRODUCTS

2.01 Lime

Lime shall be furnished in accordance with Section 1018.03 of LSSRB.

PART 3 - EXECUTION

3.01 General

- A. The subbase shall be prepared to the lines and grades shown on the Drawings.
- B. The Contractor shall make every reasonable effort to minimize the impact of airborne particles during the lime application process. Reasonable assistance to motorists and residents in cleaning vehicles and personal objects in the immediate vicinity of the Work shall be considered obligatory on the part of the Contractor. The cleaning of houses and motor homes, etc. further than 25' from the application location shall not be considered within the immediate vicinity of the Work. However, the Contractor shall notify residents along the work site at least 24 hours prior to application of the lime to insure that vehicles and residences can be secured and people and animals sensitive to air borne particles can take precaution. Claims from residents for assistance in cleaning shall be honored within 48 hours. This service shall be at no direct cost to the Owner.

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C. The contractor shall provide excavation, sheeting and bracing, and lime in accordance with the plan details. Suitable excavated material shall be stockpiled on-site or brought to a site selected by the Owner. Unsuitable excavated material shall be disposed of off-site. The handling of the excavated material, be it stockpiling, transporting offsite, or disposal, shall be at no additional cost to the Owner.

END OF SECTION 32 91 20

DIVISION 33
UTILITIES

SECTION 33 11 23- NATURAL GAS DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers the supplying all labor, equipment, materials and appliances and performing all other procedures necessary for the construction of improvements on the City of Walker natural gas distribution system in accordance with the plans and these specifications. The distribution system includes the distribution mains, valves, pipeline markers, service valves, service regulators, and meters.

1.02 MEASUREMENT AND PAYMENT

Unless otherwise indicated on the Bid Form or Plans, the measurement and payment for the work specified in this Section shall be as follows:

A. Polyethylene Gas Mains installation including fittings and conductive trace wire shall be measured to the nearest foot and paid for at the unit price per foot of various sizes of pipe installed. Payment for boring of street, highway and railroad crossings shall be measured to the nearest foot and included in the contract price per foot of bore for the various sizes of boring required. The bid price for boring shall include the cost of all pipe and fittings required to complete the project and shall not be in addition to the cost of pipe.

B. Valves shall be measured and paid for per each. The unit price for each valve shall include the valve, valve box, couplings and all additional fittings required to complete the valve installation according to these plans and specifications.

C. Service Lines measurement and payment for the installation of service lines including all fittings, except for main line tap and valve tee and the anodeless riser shall be by the linear foot of various sizes of service line. Payment for service connections shall be per each for various sizes installed and shall include main line tap and valve tee, anodeless riser, and tie in to meter, if existing. Tie ins to existing meter shall include relighting customer pilot lights. A successful shut-in test shall be performed prior to a customer's gas service being turned on and pilots being relighted. New regulator and meter installations with related stops and fittings to complete the service installation shall be by others.

D. The installation of the pipeline markers shall include the sign and post and payment shall be at the unit price bid per each marker installed.

1.03 REFERENCES

A. The applicable provisions of the following standards shall apply as if written here in their entirety:

1. ANSI American National Standards Institute ASTM American Society of Testing and Materials
2. US DOT United States Department of Transportation

1.04 QUALITY ASSURANCE

A. Only persons qualified under 49 CFR 192285 shall be allowed to join plastic pipe. Persons installing or repairing the natural gas distribution system shall undergo drug testing in accordance with DOTD requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Polyethylene Pipe. In shipping, delivering, and installing, pipe and accessories shall be handled in such a manner as to insure a sound undamaged condition. Care shall be exercised in order to avoid rough handling. The pipe and accessories shall not be dropped or have any objects dropped upon it, nor shall it be pushed or pulled over sharp projections. Caution shall be taken to prevent kinking and buckling. Any damage, including kinks and buckles that occur shall be removed by cutting out as a cylinder and replacing at the cost of the Contractor.

B. Regulators and meters. All regulators and meters must be shipped with dust caps or seals to prevent the entry of dust or moisture under normal shipping and handling conditions.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Polyethylene Pipe used in the Project must comply with ASTM D-25 13 and be manufactured in the United States.

B. Polyethylene Valves and Valve Boxes: All valves on the polyethylene pipe shall be a full port polyethylene valve compatible with the piping material and be manufactured in the United States. Approved valve and valve box manufacturers are as follows:

1. KEROTEST Poly-gas Valves
2. Rockwell POLY VALVE Ball Valves
3. Lyall Poly Ball Valve
4. Handley Valve Box
5. Continental Industries Roadway Valve Box

2.02 MATERIALS AND/OR EQUIPMENT

A. Polyethylene pipe: The polyethylene pipe for the natural gas distribution lines shall meet the following requirements:

1. Pipe and Fitting Material: All pipe shall conform to the requirements of the currently approved ASTM D-25 13 specification "Thermoplastic Gas Pressure Pipe, Tubing and Fittings." All fittings shall conform to the requirements of ASTM 03261 "Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing." All pipe shall be manufactured of virgin material, except for the clean rework material that is generated from the manufacturer's own production, if the pipe and/or fittings meet the required specifications. All pipe formulation must have suitable outdoor weather resistance. The color of all polyethylene pipes shall be either orange or yellow.
2. Pipe Design: All pipe shall be designed for direct burial as specified in D.O.T. Title 49, Part 192, "Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards," through current Amendment, for natural gas mains and services operated at 60 p.s.i.g. Or less. The pipe must also be suitable for replacing old steel mains and services. The pipe must be homogeneous and be free of holes, cracks, foreign material, blisters or other deleterious faults. The minimum design stress must comply with the requirements of ASTM D-25 13.

3. Pipe Size: The pipe shall be designed, and pressure rated to conform to the requirements of ASTM D2513
 4. Any defect such as a groove, notch, or gouge, greater than ten percent (10%) of the wall thickness of the pipe, shall not be used.
- B. Valves: Gas distribution system valves shall follow the following specifications:
1. Service-Line Valves (Meter Stops): Service-line valves (meter stops) installed above ground shall be a "tamper-proof" iron body, brass (or bronze) core, lock wing stop that complies with the requirements of Code of Regulations D.O.T. Title 49, 192.363. The minimum working pressure shall be 125 p.s.i.g.
 2. Polyethylene Valves: The polyethylene valve stub ends must be fabricated from material that is compatible with the pipe used, including the Standard Dimension Ratios (SDR).
- C. Service Taps: Service Taps shall be made by a self-tapping tee that also acts as a positive shut off at the main. The base of the tapping tee shall be designed for heat fusion to polyethylene pipe and a socket end branch connection for heat fusion to the service line pipe. The heat fusion base and socket must be manufactured from the same material as the pipe.
- D. Service Riser: Service riser to be 1" IPS epoxy coated Schedule 40 steel with 1" IPS polyethylene transition. Riser to be 24" vertical by 36" horizontal.
- E. Valve Boxes: Valve boxes shall provide access for operation and maintenance for all valves. The boxes shall be provided with a drop-in lid and the word "GAS" clearly visible. Box shall be self-- adjusting, have a 6" shaft with an arch base and be suitable for use in areas with vehicular traffic.
- F. Service Regulators:
1. Regulators shall comply with the current American National Standards Institute (ANSI) Service-type regulator Specification X-50865 and the requirements of Paragraph 192.197(a) and (b), DOT Title 49, Code of Federal Regulations. Regulators shall be shipped with dust caps or seals to prevent dust or moisture from entering in under shipping and handling conditions.
 2. Physical Characteristics:
 - Body Size: 1-inch Orifice Size: 1/8-inch
 - Maximum Inlet Pressure: 125 p.s.i.g. Set Point: 7-inches water column (w.c.)
 - Capacity: 360 cu.ft./hr. (min.) @ 10 p.s.i.g. inlet Internal Relief Valve: 1-inch vent
 - Finish: Gray enamel (ASA #49) or equal Assembly Position: Reliance, C-2 Assembly Position: Rockwell, #105 Assembly Position: Sprague, #3
- G. Pipeline Markers: Signs and posts must be used to mark the gas pipeline at each crossing of a public road or highway, at tracer wire test boxes or wherever it is necessary to identify the location of the pipeline to reduce the possibility of damage or interference. All markers must meet the D.O.T. requirements.
1. Signs: Six (6) foot long composite pipeline markers, Carsonite CUM-375, Sentry Posts, or preapproved equal shall be used. Each sign must have the following printed legibly on a background of sharply contrasting color:
 - a. The word "WARNING" followed by the words "Gas Pipeline" with a letter height of at least one (1) inch and a one-quarter (1/4) inch wide stroke.

- b. The name "OWNER" followed by telephone number. The Contractor shall verify the telephone number before manufacturing signs"

PART 3 - EXECUTION

3.01 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

- A. Polyethylene Pipe:
 1. Heat Fusion Joints. Heat fusion, in accordance with D.O.T. Title 49, Code of Federal Regulations and with the proper tools designed for this purpose, or butt fusion with socket fittings shall be used to join the pipe. Threaded fittings and joints shall not be permitted. The same materials as the pipe shall be used to manufacture the main body and fusion surfaces of the pipe fittings. Heat fusion tools shall be maintained in a good working, clean condition. All heating irons used will be checked for the correct temperature each day before production continues. After each jointing procedure is completed, the heater faces must be cleaned to remove any accumulated material. All pipe ends must be chamfered in accordance with the manufacturer's recommendations before joining the pipe to socket type fittings. Pipe ends shall be planed perfectly flat for butt fusion joints. Align component parts so that no strain is placed on the joint when they are finally positioned. Couplings and fittings shall be set true.
 2. Pipe Placement and Backfill:
 - a. When installing polyethylene pipe, sufficient slack shall be provided to allow for possible contraction. The polyethylene pipe shall not have a bend that is less than 25 times the outside diameter of the pipe. If a bend is required that is less than 25 times the outside diameter of the pipe, then an approved polyethylene elbow fitting is required. A fusion joint shall not be placed at a bend. During extremely high temperature conditions it may be necessary to cool the pipe before the last connection.
 - b. No polyethylene gas line shall be installed above ground. During maintenance, repair, and tie-in work, temporary polyethylene gas lines may be used above ground.
 - c. The minimum clearance required between the distribution piping and other underground structures is twelve (12) inches. Trench width and minimum cover shall comply with plans. Unless otherwise shown on plans, pipe embedment shall be select material and remainder of trench may be backfilled with spoil from trenching operation.
 3. Pipe Installed in Casing: Each end of the casing shall be sealed to prevent soil and water from migrating into the casing when the carrier pipe is installed in casing. All casing shall meet the requirements in 192.323 D.O.T., Title 49, Code of Federal Regulations, as well as those imposed by permit, easement and other appropriate controlling factors.
 4. Service Lines: Service lines to be 1-inch diameter unless otherwise shown on plans. All materials and equipment shall be installed with the approved recommendations of the manufacturer to comply with the contract documents and the requirements of Paragraph 192.361, D.O.T., Title 49, Code of Federal Regulations. Workmen skilled in this installation must perform the work. All joints on the service line must conform to the requirements of Paragraphs 192.281, 192.283, & 192.285, D.O.T., Title 49, Code of Federal Regulations.
 - a. Service Lines Connected to a Polyethylene Main. All hot taps shall be made by qualified fusers using self-tapping tees. A sidewall fusion jig must be

used for tapping tees. When the outlet fusion joint is finished, it must be covered by a protective sleeve.

b. Service Lines Connected to a Steel Main. An approved self-tapping welded tee shall be used for making service taps on steel mains. All welding shall be done by welder certified under API- 1104 standards.

c. Service Riser: The service riser must be protected from vehicular traffic. Support for the riser must prevent the transfer of forces to the service pipe because of accidental movement of the riser or natural settling.

5. Conductive Tracer Wire: Install conductive tracer wire with all polyethylene gas lines.

6. Swabbing and Pigging: Prior to joining, all individual gas main lengths shall be swabbed. All gas mains shall be pigged prior to initiation of gas service, but after joining has been complete. The pigs used shall be suitable for different size pipes and be designed for polyethylene pipe use. Any pig that could damage the pipe, such as wire brush type pigs, shall not be acceptable for use. Only use of compressed air to drive the pig through the pipe shall be permitted.

B. Valves and Valve Boxes: Install valves and valve boxes plumb. All boxes shall be installed flush with the finished grade. Support box with brick or other approved material. Adequate backfill shall be placed around the valve boxes and valve extension boxes to prevent any damage or settlement to the pipeline that may be transferred to the pipe through the valve box. Protective sleeves shall be installed over fusion joints and extend through the valve boxes on the polyethylene valve installations.

C. Signs and Posts: After the pipeline installation has been completed, the Contractor shall install signs and posts at the locations designated by the DPW. Bury the anchor end of all posts approximately two (2) feet deep.

D. Shut Down of Work: When work has shut down for each day, all lines shall be capped, sealed, and pressured to 20 pounds with air. When a Project is not immediately tied-in, plug and seal all openings in the pipe. If a pipeline is to be abandoned in place, then disconnect the gas supply source, purge all the gas from the abandoned system, and seal all the ends.

E. Purging Pipes and Fittings: A combustible gas indicator shall be used when purging mains and piping. When purging gas from abandoned lines, the air and the gas must be discharged aboveground and directed away from power lines or structures. When purging air from new lines, installation of a 3/4 service saddle and non-corrodible riser is required four (4) feet from each dead-end on all new installations of pipe to purge air from all dead ends simultaneously. Release gas into new lines at a rate that will prevent formation of a hazardous mixture of gas and air or precede natural gas with a slug of inert gas.

3.02 FIELD QUALITY CONTROL

A. The Contractor shall test all gas mains with 90 psig. air and show that the lines are leak free, prior to the initiation of gas service. Each day's work shall be tied into the preceding day's work and tested overnight. A pressure-time gauge with a range no greater than 0 -200 psig. and in good working order shall be furnished by the Contractor. All testing shall comply with DOT. Title 49, Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards!

B. The location of the project along with the temperature at the time the test pressure is placed upon the pipe shall be recorded on the pressure chart the pressure charts shall be

given to the DPW or the designated representative of the DPW daily. In order to facilitate daily testing, appropriate testing apparatus shall be used. Leaks shall be repaired in a manner approved by the DPW or the designated representative of the DPW before additional lengths of pipe that need to be tested are added to the main.

C. If service lines are installed at the same time as the mains, then service lines shall be included in the testing of the mains. If service lines are installed after gas service has been initiated, then the Contractor shall test each service line individually to stand up to an air test of 90 psig. for twenty (20) minutes. If a leak is discovered, then the Contractor shall immediately make the appropriate repairs, in a method approved by the DPW. All existing service lines that are disconnected from the main temporarily shall be tested as if they are new lines before being placed back into service.

D. A 24-hour test shall be placed on the entire system of mains prior to initiation of gas service. If a portion of the gas service has met the requirements of the leak test and it is possible for the other sections to be tested independently, then the DPW or the designated representative of the DPW may approve initiation of gas service for that portion.

END OF SECTION 33 11 23

SECTION 33 21 50 - WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment, and incidentals required and install, complete, ready for operation, field test, disinfect, and remove chlorinated water for all pipe and incidentals as shown on the drawings and specified herein.

1.02 QUALIFICATIONS

Specification references to standard Specifications of AWWA, ASTM, ANSI, AWWA, etc., shall apply to the latest edition, revision or addendum thereto.

PART 2 – MATERIALS

2.01 PIPE AND FITTINGS

A. Ductile Iron Pipe

Ductile iron pipe shall be mechanical joint type for underground installation and flanged type for above ground installation and manufactured and factory tested in accordance with AWWA C150 and AWWA C151, Class 50, cement lined conforming to AWWA C104.

B. Polyvinyl Chloride (PVC)

1. Polyvinyl Chloride (PVC) plastic pipe 4 inches and larger shall be Class 150 with integral bell that meets the requirements of AWWA C-900 and Underwriters Laboratories (UL). The pipe shall meet requirements of wall thickness, of dimension ratio DR18 and shall be manufactured to ductile iron size outside dimensions. The standard length shall be 20 feet. The bell shall consist of an integral wall section with reinforced "locked-in" rubber ring. Mechanical joint fittings will be used with PVC pipe.
2. Polyvinyl Chloride (PVC) plastic pipe less than 4 inches shall conform to the requirements of ASTM D-1785, Schedule 40, or ASTM D2241, Latest Revision.

C. Polyethylene (PE) Pipe

Polyethylene pipe shall be Class DR-11 Ductile Iron size that meets the requirements of AWWA C-906. Polyethylene pipe will only be allowed in remote areas and will not have any service taps made on it. The Owner will make the final decision on allowable usage of polyethylene pipe.

D. Fittings

Ductile iron mechanical and restraining joint fittings shall be the compact type conforming to AWWA C153 and AWWA C110 rated for 350 psi working pressure, cement lined in accordance with AWWA C104 with joints, ring type gaskets, lubricant and accessories conforming to applicable requirements of AWWA C111. Corten coated bolts shall be used.

2.02 VALVES AND APPURTENANCES

Mechanical joint gate valves shall be iron bodied, epoxy coated interior, fully supported modified wedge disc with resilient rubber seat ring internally reinforced by a concentric steel ring, which are manufactured and tested in accordance with AWWA specification C509. They shall be 200-psi working pressure and 400-psi test pressure. Valves shall have non-rising stem with a 2 inch square wrench nut, with stainless steel nut, shall open by turning counter-clockwise and shall be equipped with o-ring stem seals. The bonnet bolts shall be stainless steel type 304. All valves shall have extended wedge-bearing caps. Valves shall have a rolled bar stock bronze stem. The stem shall have a safety groove to prevent excess torque and damage to the valve by over tightening. Valves shall be Mueller series A2370-20 (Mechanical Joint/ Mechanical Joint) or 2360-16 (Mechanical Joint/Flange) Resilient Wedge Gate Valve as required, or approved equal.

Tapping sleeve valves shall be similar to gate valves specified above and shall be Mueller A2360-16 or approved equal.

Tapping sleeves shall be the stainless steel sleeve type. The body shall be a full circle band for repair clamps, stainless steel 18-8 type 304 with gridded overlapping virgin neoprene rubber gasket. The flange shall be 304 (18-8) stainless steel or ductile iron AWWA C207 Class D ANSI 150 lb. Drilling recessed to accept a standard tapping valve. All bolts shall be type 304 stainless steel. Tapping sleeves shall be Smith-Blair 662 or 663, TCM432, Romac SST, or Mueller H=304.

Valve boxes shall be constructed of cast iron for roadway service, with a minimum inside diameter of 5 ¼ inches. The box shall be the adjustable screw type consisting of two pieces (a base and top section) and shall include a cover. The cover shall be of the deep (2 inches) socket type with the word WATER cast on the top. The box shall be Tyler 461-S/562-S or approved equal.

Valve box risers shall be made of cast iron for roadway service. The riser shall fit into the top section of Tyler 461-S/562-S valve boxes and accept the lid. The riser shall be a Trumbell 357 series or approved equal.

Fire hydrants shall conform to AWWA specification C-502. All fire hydrants shall use Grip Rings with Teflon bolts (accessory package) as manufactured by Romac Industries. Main valve shall be 5-¼ inch compression type that closes with pressure. Hydrant shall have two @ ½ inch hose nozzles and one 4-1/2 inch pumper nozzle with nozzle caps and cap chains. All muzzles shall have National Standard threads. Operating nut shall be pentagonal measuring 1-½ inches from point to flat. Hydrant shall open by turning counter-clockwise. Hydrant shoe shall have mechanical joint connection for 6-inch pipe. The inside shoe shall be epoxy coated. Hydrant barrel shall be of suitable length to set breakaway flange between 5" and 8" above finished grade. Fire hydrants shall be red in color. Hydrants shall have two (2) drain holes. The manufacturer shall provide a 10-year warranty on all parts. Hydrants shall be Mueller -423 Super Centurion 250. Fire hydrant depths shall be verified by the Contractor and actual height and length of connection required shall be included in his bid price.

Romac or equal grip ring pipe restrainer shall be used for the installation of fire hydrants, tees, valves and any directional change of water main.

Sleeves or clamps shall not be used for water main installations except for connection to existing mains or as directed by the Owner.

Concrete precast slabs around valve boxes shall be 2,500-pound compression strength at 28 days, two feet square and 4" thick. The circular opening in the center of the slab shall be approximately ¾" greater than the outer diameter of the valve box.

2.03 THRUST BLOCKS

Repair clamp shall be a complete circle stainless steel clamp pre-assembled with a gasket, a bridge plate, lugs, and nuts and bolts. The band shall be stainless steel type 304 with ends contoured into and positively attached to ductile iron or stainless steel lugs. The gasket shall be a lap type with tapered ends, gridded, of virgin neoprene rubber for water service. The bridge plate shall be stainless steel type 304 recessed flush and bonded into the gasket. Bolts shall be high strength type 304 stainless steel. Lugs shall be ultra high strength ductile iron to ASTM A536 or stainless steel. The clamp shall be Smith-Blair 226 or 261, JCM 101 or 131, Romac CL1 or SS1, or Mueller 210 or 211 Stainless Steel.

Thrust blocks shall be made with celcure pressure treated southern yellow pine, either rough sawn or dressed with not less than 0.75 lbs. Retention. The procedure for determining thrust block size recommended by the pipe manufacturers installation instruction shall be used. Test pressure on the system will be assumed to be 124 psi.

Lumber for thrust blocks or fixture foundation shall be celcure pressure treated southern yellow pine C-2.40 treated lumber for underground service.

2.04 BEDDING MATERIAL

Limestone shall be used for bedding when unstable subgrade conditions are encountered in the field that will provide inadequate pipe support. When such conditions are encountered, bedding shall be used in the amount shown on the plans or as directed by the Engineer. Additional bedding that is installed without the prior approval of the Engineer shall be at the Contractor's expense.

PART 3 – EXECUTION

3.01 INSTALLATION

Water mains shall be positioned as shown on plan drawings. Water mains shall be valved at each intersection as required at tees or crossed and at minimum of every 1000 feet. Valves shall be located as shown on approved plans and shall be set with stems vertical. The contractor will indicate the location of each valve by means of a "V: shaped notch cut into the curbing at the valve site. Each valve must have a valve box centered over the valve stem to allow free access of a valve wrench. The top shall be set level with the finished grade surface. A precast concrete slab shall be set level with the finished grade surface. A precast concrete slab shall be set around each valve box and the top level with the finished grade surface. A tee shall be used for 90° bends.

Cover over water lines shall be maintained as follows"

- A. All mains shall have 48" of cover.
- B. Mains that cross under ditches shall be 24" to 28" below the invert of the ditch.
- C. Mains that cross under a canal shall be 26" to 40" below the invert of the canal.

Water Main Looping:

All 6" water mains of 1,500 feet or more and 8" water mains of 1,000 feet or more, including existing mains, shall be looped where feasible to eliminate dead ends.

Fire hydrants shall be installed or replaced as indicated on the plans or as directed by the Engineer. Install all hydrants in an exact vertical position. Pumper nozzles shall face toward the street. Hydrant

shall have proper bury length so that the bottom of the safety flange is between 5" and 8" above finished grade level. Each hydrant shall have a 6" main lead of at least 3 feet. Hydrants shall be attached with 3.4" threaded zinc plated rods and blocked. Hydrants located along highway shall be valved unless waived by the Owner.

Pipe shall be received, stored, handled and installed strictly in accordance with the manufacturer's instructions. Only lubricant specified by the pipe manufacturer shall be used. Ends of pipe and fitting shall be thoroughly cleaned before applying joint lubricant. During joint assembly, PVC pipe shall be pushed into the bell up to the circumferential reference mark. In no case will solvent cement be used for joining pipe. Tighten mechanical joint bolts alternately on opposite sides in order to compress the gasket uniformly. All underground ductile pipe and fittings shall be covered with 8-mil polyethylene film.

Hot taps made by the Contractor on existing water mains shall be made with a Mueller CL12 or C1-36 tapping machine.

Pipe shall be installed according to applicable AWWA Standards.

All plugs, tees and bends shall have celcure treated lumber rated for underground use for thrust blocks and fixture foundation of sufficient size to resist the force of water on or through the fitting.

Each section of pipe and each fitting shall be examined for defects before lowering in the trench. Any defective or damaged material shall be rejected and removed from the work site. All pipe and accessories shall be carefully lowered into the trench in such a manner as to prevent damage. Under no circumstances shall pipe or accessories be dumped or dropped into the trench. Holes for couplings or bells shall be cut for all pipes regardless of type of pipe used. The barrel of the pipe shall rest evenly on the trench from end to end except for coupling or bell holes. If the trench bottom will not support the weight of the fitting, a foundation of select earth or shell shall be installed. Holes shall be sufficiently large to allow proper makeup of joint so that joints do not support the pipe weight.

All pipe and material shall be kept clean during and after laying. If necessary, a swab will be used. Trench water shall not be permitted to enter pipes. The Owner reserves the right to suspend pipe-laying operations when unsuitable trench conditions exist. When pipe laying is not in progress, the open ends of the pipe shall be closed by use of temporary pipe plugs or night caps. Plywood or similar make shift blocking which does not produce a watertight seal will not be acceptable.

All pipes shall be laid true to alignment and grade. Required horizontal or vertical deflection shall not exceed 75 per cent of the maximum recommended by the pipe manufacturer. A short length of pipe, approximately 3-6 feet, shall be used as needed to place fire hydrants, valves and fittings in required locations. A short length (about 6 feet) of pipe shall be used on each side of all fittings and valves. This pipe shall be included in the cost for fire hydrants, valves, or fittings.

Any underground facility installed on a highway right-of-way that is non-conductive to electric current must be installed with a non-corrosive tape placed directly over and on the center of the facility about 24 inches above the pipe. The tape must be connected to all fixtures and appurtenances. A tracer wire shall be attached directly to the pipe, on fixture and appurtenances. The tracer wire will be run to the tip of each valve box to allow direct connection to the wire.

Clearance between water lines and all other underground obstructions shall be not less than one foot except by special permission. Horizontal clearance between parallel water and sewer lines shall be not less than six (6) feet between sides of the pipes.

WARNING TO CONTRACTORS

The Contractor shall conduct all work in such a manner that will not contaminate drinking water in existing lines.

The Contractor shall not expose, cut, tap into or connect to existing lines with first advising and securing permission from the Owner and an Owner's representative shall be present. The Contractor shall not open or close any valves or any fire hydrants without the permission of the Owner and an Owner's representative must be present. The Contractor must purchase water used for any purpose other than for pre-arranged flushing and testing of the water lines. The Contractor must take every precaution to keep water mains clean before and during installation to avoid unnecessary delays due to bacteriological contamination.

3.02 INSPECTION

The installation of water systems shall be inspected by the Owner's designated representative for compliance with approved plans and specifications at the expense of the developer.

The Contractor shall extend full cooperation to the inspector in the course of making inspections and shall comply with all reasonable requests to observe work in progress and to review work that has already been performed. The inspector will be allowed an opportunity to inspect all lines, valves and fittings before being covered. The inspector shall witness required pressure and leakage test.

The Owner shall be reimbursed for all fees and expenses incurred by the inspector, prior or concurrent with requesting the Owner to approve the installation.

3.03 TESTING AND DISINFECTING WATER LINES

All testing and disinfection shall be performed on each 1,000 feet of waterline installed. Flushing, pressure test and leakage tests for ductile iron and PVCC pipe shall be performed in accordance to applicable sections of AWWA C600 at the pressure, time and allowable leakage stated below.

A. Flushing

Before testing and disinfecting, the pipeline shall be flushed clean with potable water. The Contractor shall notify the Owner prior to filling of flushing new lines. The Contractor shall not operate any valves in the Owner's system without securing permission. Owner's personnel shall be present prior to any flushing.

B. Pressure Test

Owner's personnel shall be present prior to the commencement of any pressure test. Each section of line between valves, or a longer section if permitted by the Owner, shall be submitted to a hydrostatic pressure test of 124 psi for not less than two hours.

Water lines being pressure tested must be connected to an Owner's line by the use of a reduced pressure backflow assembly.

Each section of pipe to be tested shall be slowly filled with water, and all air expelled from the pipe through taps at points of highest elevation in the section to be tested. If hydrants or blow offs are not available at high spots in the line for air removal, then

taps shall be made to accommodate a standard 3.4" Mueller H-15000 corporation stop with Mueller threads, or equal, which shall be removed and the tap plugged with a brass plug upon completion of the test.

After the test pressure of 125 psi has been obtained, the Contractor shall verify that all valves in the section being tested are opened wide.

If any loss in pressure is noted during the two-hour test period, the Contractor shall examine the pipeline and determine the source of the leakage. If leaks are found in a joint, the joint shall be disassembled and necessary repairs made. Clamps shall not be use to repair leaks. Any cracked or defective pipes, fittings or specials discovered in consequence of this pressure test shall be removed and replaced with sound material at the Contractor's expense. After repairs, the section of line shall be retested until a hydrostatic pressure of 125 psi is maintained for not less than two hours.

C. Leakage Test

After the water line has passed a pressure test, a leakage test shall be performed. Leakage is defined as the quantity of water pumped into the section of pipeline being tested to maintain the specified test pressure. It is usually measured by the pumping from a calibrated suction tank. Care must be taken to expel all entrapped air and have the main completely full of water before start of the test.

Water lines being tested for leakage must be connected to an Owner's line by the use of a reduced pressure backflow assembly.

The pipeline as a whole or in such sections as the Owners may designate, shall be tested to a pressure of 100 psi. The 100 psi pressure shall be held a sufficient time to allow a true evaluation of leakage and shall depend upon the length of line tested, except, that in no event shall the pressure be maintained for less than two hours. Suitable means shall be provided for determining the quantity of water lost by the leakage during the final hydrostatic pressure test. No pipeline or portion thereof shall be accepted until or unless the leakage is within the limit of 0.00137 gallons per joint per inch of nominal pipe diameter per hour.

Any section of line that fails to meet the leakage test shall be repaired by the Contractor and retested until the leakage is within the allowable limits. The Owner's inspector must witness final pressure and leakage tests.

D. Disinfecting

After completion of leakage test, all parts of the pipelines installed shall be disinfected by the Owner at the Contractor's expense. Disinfection shall conform to AWWA Standard C651.

E. Chlorine Application

All new mains and services and any portion of the existing mains repaired shall be chlorinated by the application of sufficient chlorine to provide a chlorine residual of not less than 10 ppm after the chlorine solution has been held in the pipeline for 24 hours. Mains should be sufficiently clean after proper precautions during laying and flushing

of the line so that an initial application of 50 ppm of chlorine will produce the required residual. Additional chlorine may be necessary if the mains have been kept clean. Calcium hypochlorite conforming to AWWA B300 is to be used for chlorination. Chlorine solution shall be applied at one end of the line being disinfected. Water shall be withdrawn from the opposite end and from the ends of all branches until the chlorine solution completely fill all lines to be disinfected. Valves in the lines being chlorinated shall be operated while the chlorine solution is in the line.

NOTICE

If the discharge of chlorinated water would be harmful to vegetation or wildlife, measures must be taken to impound the highly chlorinated water or to remove and dispose of in an approved manner at no additional cost.

F. Final Flushing

After the 24-hour retention period, the chlorine solution shall be flushed out of the lines and the lines filled with potable water. The lines shall then stand for 24 hours before samples are taken for bacteriological test. Sample points shall be installed as directed by the Owner. Samples shall be taken the Owner's personnel and submitted to the State Department of Health for bacteriological examination. If any samples show a positive reaction, that portion of the line represented by the sample shall be disinfected again and the flushing and sampling repeated. This procedure shall be repeated until all portions of the system are completely disinfected.

END OF SECTION 33 21 50

SECTION 33 21 75 - GRAVITY SEWER LINES

PART 1 – GENERAL

1.01 Related Items Specified Elsewhere:

- A. Excavating, Backfilling and Compacting for Utilities & Structures– Section 312200

1.02 Description

The Contractor shall furnish all labor, supervision, materials, and equipment required for installation of new sewer lines, connections, fittings, clean-outs, adapters, etc., required by these drawings and specifications. All workmanship and materials shall conform to the contract plans, specifications and local codes.

1.03 Applicable Publications.

The following publications, referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

American Water Works Association (AWWA) Standards.

Southern Building Code Congress International, Standard Plumbing Code (1994 Edition), including LA 2000 amendments (SBCCI)

1.04 General Requirements.

Construction of sanitary sewer lines and house service lines shall be defined as the excavation, placing bedding and/or foundation, laying of new pipe at the proper slope, backfill, fittings, clean outs, adapters, connections, seeding, fertilizing and cleanup as required by the contract documents. Construction shall also include removal, replacement and repair to personal property disturbed by the contractor in installing sewer service to adjacent property owners. The Contractor shall warranty his craftsmanship, materials and labor for one year after the date of completion.

1.05 Coordination for use of more than one crew in laying the main in various sections of a system at a given time must be arranged with the Engineer in writing.

PART 2 - PRODUCTS

2.1 Foundation. The bedding material shall be stone and conform to LSSRB Section 1003.08 and shall be placed in accordance with the contract drawings.

2.2 PVC pipe High Density Schedule 40 and fittings for gravity sewer line shown on plans. Provide cast iron cleanout covers embedded in reinforced concrete collars.

2.3 PVC pipe for gravity sewer outside of building line (Size 6" - 15"): PVC Gravity Sewer Pipe and Fittings, High Density PVC (Size 6" or less), SDR35 (Size 8" through 15") shall be limited to a maximum depth of less than 12 feet. The pipe shall be as manufactured by Johns-Manville, or approved equal. The pipe and fittings shall have Elastomeric Gasket Joints and shall be manufactured in accordance with "Type PSM Poly (VINYL CHLORIDE) (PVC) Sewer Pipe and Fittings", Designation

D3034, of ASTM or the latest revision thereof. All pipe shall be installed in accordance with ASTM Designation D2321 and the plans all within the limiting values imposed by these specifications.

2.4 Polyethylene Pipe and Fittings:

Materials used for the manufacture of polyethylene pipe and fittings shall be high density, black PE 3408 meeting the following physical property requirements:

Test (1)	Typical	Property	Unit	Procedure	Value
		Material Designation	----	PPI/ASTM	PE 3408
		PPI Material Listing P34CH	----	PPI	PLEXCO
		Material Classification	----	D-1248	III C 5 P34
		Cell Classification	----	D-3350	345434C
		Density	gm/cm3	D-1505	0.955
		Melt Flow	gm/10 min.	D-1238	0.1
		Flexural Modulus	psi	D-790	133,000
		Tensile Strength	psi	D-638	3,500
		ESCR	Failure % hrs.	D-1693	Fo>5000
		HDB	psi	D-2837	1600
		UV Stabilizer	% Carbon black	D-1603	2 to
3		Elastic Modulus	psi	D-638	100,000
	F	Brittleness Temperature		D-746	-180
		Vicat Softening Temperature	F	D-1525	255
		Thermal Expansion	in/in/F	D-696	8 x 10-5
		Hardness	Shore D	D-2240	64
		Molecular Weight Category	-----	-----	Extra High
		Molecular Weight	-----	GPC	>250,000
		HDB @ 73.4 F.	psi	D-2837	1600
		HDB @ 140 F.	psi	D-2837	800

Test procedures are ASTM unless otherwise specified. (PPI = Plastics Pipe Institute; GPC = Gel Permeation Chromatography).

Pipe and fittings shall be manufactured from identical material meeting the requirements listed above. The manufacturer shall certify that samples of the manufacturer's production pipe have been tested in-house, in accordance with ASTM D-2837, and validated in accordance with the latest revisions of PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the Manufacturer to be 1600 psi at 73.4°F. and 800 psi at 140°F. The pipe and fitting manufacturer shall have an independent PPI Material Listing in accordance with PPI TR-3 and TR-4.

Pipe and fittings shall be produced by the same manufacturer.

Pipe and fittings shall be pressure rated using the certified HDB data acquired from in-house testing. HDB data from the above table shall not be used for this purpose. If HDB data acquired from in-house testing is not available, pipe and fittings from that manufacturer shall not be acceptable. Pipe pressure ratings shall be determined in accordance with the following formula:

$$P = 2 \times \text{HDB} \times F / (\text{SDR} - 1)$$

Where

P	=	Pressure rating, psi
HDB	=	Hydrostatic Design Basis from in-house testing, psi
F	=	Design factor
SDR	=	Standard Dimension Ratio = OD/t
OD	=	Pipe outside diameter, inches
t	=	Pipe minimum wall thickness, inches

For service temperatures of 73.4°F. or below, the HDB at 73.4°F. shall be used. For service temperatures between 73.4°F. and 140°F., HDB values may be interpolated. The Design Factor, F, shall be 0.50 or a value specified by the responsible Design Engineer.

Approximate PE 3408 polyethylene pipe pressure ratings using a design factor of 0.50 and an HDB of 1600 psi at 73°F. are presented in Table 1.

Table 1. Pressure Ratings of PE 3408 Polyethylene Pipe

SDR	(PE 3408)
11	160
13.5	130
17	100
21	80
26	65
32.5	50

Pipe shall be manufactured in accordance with ASTM F-714. Dimensions and tolerances for pipe outside diameter and minimum wall thickness shall be in accordance with ASTM F-714.

Fittings shall be manufactured to the requirements of ASTM D-3261 and this specification.

1. Fabricated fittings shall be manufactured from pipe of at least one SDR heavier pipe than the system piping, and shall be pressure rated to match the system piping.
2. The butt fusion outlets of fabricated fittings shall be machined to the same SDR as the system piping to which they are to be fused.
3. Fabricated fittings 18" IPS and larger, manufactured from SDR 21 or higher materials shall have the body reinforced with a fiberglass overwrap to prevent mechanical damage during installation. The overwrap shall not be used to increase the pressure rating of the fitting.
4. The directional outlet of fabricated fittings 12" IPS and larger shall be designed for flanged connection to facilitate mechanical connection in the trench.
5. The manufacturer shall subject samples from each molded fittings production lot to X-ray inspection for voids. Voids shall not be permitted, and if found in the samples, the entire production lot shall be X-ray inspected. If additional voids are found, the production lot shall be rejected.

2.5 Manholes:

1. Manholes (Precast Shaft, Cone Top, and Base Pad Construction): conform to ASTM C478; integral base pad.
2. Watertight Connectors: ASTM C923, flexible watertight connectors, KOR-N-SEAL (NPC Systems, Inc.), Z-LOK XP (A-Lok Products, Inc.) or approved equal.
3. Frame and Cover: Size and type shown on Typical Sewer Details.
4. Epoxy coat interior as per East Baton Rouge Standards.

PART 3 - EXECUTION.

3.1 Sequence. Construction of a sewer line or manhole shall follow the sequential order as listed below:

- (1) Any existing sewer line or manhole involved in the new construction shall be isolated (normal flow re-routed if necessary by by-pass pumping or other means).
- (2) The existing sewer line or manhole shall be excavated and completely uncovered at tie-in points. If well-pointing is required, then applicable methods for well-pointing shall be carried out.
- (3) For pipe placement, the trench shall be shaped to conform to required slope and grade. As required by soil conditions, the trench shall be undercut as necessary for placement of pipe bedding as noted on the plans and as specified. The new sewer pipe shall then be laid in the trench.
- (4) Manholes and pipe shall be tied in and the trench or excavation shall be backfilled.
- (5) House service lines shall be installed and connected to sanitary sewer lines.

3.2 General Laying Conditions for Pipe and Fittings.

3.2.1 Pipes and fittings shall be carefully inspected after delivery on the site of the work and will be rejected if in the opinion of the Engineer they are defective in such a way as to endanger the strength of the sewer or the tightness of the joint. The installation of all pipes shall be in conformance with the respective manufacturer's guidelines except where specific procedures outlined therein are contrary to the specifications for this contract. Prior to beginning work, the Contractor shall verify the elevations of all existing inverts involved in the construction.

3.2.2 No pipe shall be set in place and no joint shall be made with water standing in the trench or the bell hole. Whenever pipe laying is stopped, either for the night or for any other cause, the end of the pipe shall be securely closed to prevent the entrance of water, mud, or other matter. Pipe shall be secured in such a manner as to prevent the end pipe from being dislodged by sliding or other movement of the backfilling.

3.2.3 The pipes and fittings shall be so laid in the trench that after the sewer is completed, the invert thereof, shall conform accurately to the grades and alignment required. At any stage of construction of a straight stretch between two consecutive manholes, the zero, or starting end of the pipe shall be clearly visible on looking through the pipe from the other end, with the full cross-section of the interior of the pipe in clear view. Pipe sections shall be laid such that flow enters the bell end of the pipe.

3.3 Backfilling.

3.3.1 Backfilling of sewer trenches shall begin as soon as the Engineer is satisfied that the joints have been made properly and after any required inspection by representatives of the Owner. Pipe bedding material shall be placed in the trench in such a manner as not to disturb the pipe and thoroughly, but carefully, compacted under and around the pipe as shown on the contract drawings. The backfill material placed above the bedding material shall be as specified in Section 02221 and as shown in the contract plans.

3.3.2 Backfilling around manholes shall be done after installation of the manhole, connection of pipes and inspection by the Engineer. Selected backfill material shall be structural fill and shall be placed and compacted as specified in 02221.

3.3.3 Grass areas affected by house service line installation shall be seeded/sodded and fertilized. Cost for seeding/sodding and fertilizing shall be included in lump sum cost for "Seeding, Fertilizing and Watering".

3.4 By-Pass Pumping. For any existing sewer lines and manholes involved in the construction work under this contract (to be tied-in, etc.). The Contractor shall provide adequate pumping capacity, back-up pumps so as to avoid sewer overflows, suction/discharge hoses, roll-over ramps at all intersections where hoses may be traversed by vehicular traffic or construction equipment and a sewer overflow protection plan conforming to the requirements of Owner.

3.5 Testing. The sewers shall be true and to line and grade and shall not have any infiltration of ground water. An infiltration measurement will be made by the Contractor to determine acceptability. The Contractor will be responsible for paying for any subsequent re-testing due to failure of the system to pass the initial test. All sewer pipes shall be mandrelled. The Contractor will install the pull lines and pass the mandrel through the lines selected by the Engineer. Test will be witnessed by the Contractor, Engineer, and a representative of the Owner. The Contractor shall provide the mandrels for all tests. Mandrels shall be passed any time after installation and final backfill of the trenches and before final acceptance. The Contractor shall bear the cost of any testing required.

3.6 Infiltration and Lamp Test.

Infiltration rate shall be 0 (zero) gallons per inch of diameter per mile per 24 hours; the Contractor shall repair any detectable leaks. The infiltration test is the responsibility of the Contractor and shall be witnessed by the Engineer and a representative of the Owner. The Contractor shall bear the cost of infiltration testing.

Contractor shall lamp test sewer lines selected by the Engineer. All testing means and methods shall be submitted to the Engineer for approval prior to testing. The Contractor shall bear the cost of lamp testing. Test will be witnessed by the Contractor, Engineer, and a representative of the Owner.

3.7 Low Pressure Air Testing:

The low pressure air test shall be performed by the Contractor. Cleaning of the pipe immediately prior to the application of the Acceptance Test is recommended. The Contractor shall furnish test plugs, air compressor, test gauge, stop watch, and personnel for conducting the test under the direction and supervision of the Engineer. The Owner shall have the option to have all equipment furnished by the Contractor independently checked and certified for accuracy at any time.

Immediately following the pipe cleaning, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until pressure reaches 4.0 psig. At least two (2) minutes shall be allowed for temperature stabilization.

The rate of air loss shall then be determined by measuring the time interval required for pressure to decrease from 3.5 to 2.5 psig. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psig is not less than shown in the "Allowable Time Table". NOTE: (If the pressure remains above 3.5 psig for the allowable time the test requirement has also been met.)

At the Engineer's option, when the ground water level is above the sewer main, the system shall be tested by slowly increasing the pressure to a pressure equal to height of water (in feet) above the invert divided by 2.3. The allowable drop in pressure and time shall be consistent with the "Allowable Time Table."

ALLOWABLE TIME TABLE

PIPE SIZE	TIME	
	MINUTES	SECONDS
6"	3	15
7"	3	18
8"	4	57
10"	5	43
12"	5	30
15"	7	30
18"	8	30

END OF SECTION 33 21 75

SECTION 33 41 50 - STORM DRAINAGE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes gravity-flow, nonpressure storm drainage outside the building, with the following components:
 - 1. Cast Iron Drains.
 - 2. Reinforced Concrete Pipe
 - 3. PVC Pipe

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. FRP: Fiberglass-reinforced plastic.
- D. LLDPE: Linear low-density, polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. RTRF: Glass-fiber-reinforced, thermosetting-resin fitting.
- I. RTRP: Glass-fiber-reinforced, thermosetting-resin pipe.
- J. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silttight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Special pipe fittings.
 - 2. Drains.
- B. Shop Drawings: For the following:

1. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.

C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures. Provide cut sheets for all fittings.

D. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Architect's [Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPE MATERIAL AND FITTINGS

A. A-2000 PVC STORM DRAIN AND FITTINGS

A-2000: PVC pipe shall comply with ASTM F 794 or ASTM F 949, Series 46 with UV inhibitors or AASHTO M304 minimum pipe stiffness 46. The resin shall have a minimum cell classification of 12454-C in accordance with ASTM D 1784.

B. Polyvinyl Chloride (PVC) Pipe Joint Requirements:

- 1) Type 3 Joints (T3): These joints shall pass the 10 psi (70 kPa) hydrostatic pressure test.

2) Type 2 Joints (T2): These joints shall pass the 5 psi (35 kPa) hydrostatic pressure test.

3) Type 1 Joints (T1): These joint shall provide a soil tight joint.

4) Joints with Split Coupling Bands: Split coupling bands shall be one piece and composed of the same material as the pipe. The bands shall be the same thickness as the base pipe. The width of the band shall be equal to half the diameter of the pipe but shall be a minimum of 12 inches wide. The band shall be secured to the pipe with a minimum of five stainless steel or other approved corrosion resistant circumferential bands.

Gasket Materials:

1. Rubber: AASHTO M198, Type A; lubricant as specified by manufacturer.
2. Flexible Plastic: AASHTO M198, Type B; gasket and primer to be from a source on the DOTD QPL.

The installation of PVC pipe shall conform to the pipe manufacturer's specifications and guidelines and shall be in accordance with AASHTO standard specifications for Highway Bridges, Section 26, Division II or ASTM B 788 and in conformance with the project plans and specifications. If there are any inconsistencies or conflicts, the contractor must bring them to the attention of the project engineer. It is always the contractor's responsibility to follow OSHA guidelines for safe practices.

For PVC pipe, compaction equipment or methods that cause excessive deflection, distortion, or damage shall not be used. Construction loads may be higher than final loads. Refer to the pipe manufacturer's specifications and guidelines for extended details.

The backfilling for PVC pipe shall abide by the manufacture's specifications and guidelines with the exception that soil layers shall be in loose lifts not to exceed eight inches in thickness. Sand will be allowed as backfill material for PVC pipe (at no direct pay), with the exception that A-4 or better material be used within 6' of catch basins and manholes.

Pipe shall be tested to ensure that vertical deflections do not exceed 5.0 percent. Maximum allowable deflections shall be governed by the mandrel requirements stated herein.

Deflection tests shall be performed no sooner than 30 calendar days after installation and compaction of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

For pipe 36 inches and less in diameter and for all PVC pipe sizes having a backfill of 1 to 2 feet of cover, a mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. The mandrel shall be approved by the engineer prior to use. Use of an unapproved mandrel or a mandrel altered or modified after approval will invalidate the test. If the mandrel fails to pass, the pipe is overdeflected. Unless otherwise permitted, overdeflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed and replaced with new pipe. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be removed and replaced with new pipe.

The mandrel shall be a rigid, nonadjustable, odd-numbered legged (minimum 9 legs) mandrel having a length not less than its nominal diameter or 24 inches whichever is less. The minimum diameter at any point shall be 5.0 percent less than the base inside diameter of the pipe being tested. The mandrel shall be fabricated of steel, aluminum or other approved material fitted with pulling rings at each end. The nominal pipe size and outside diameter of the mandrel shall be stamped or engraved on some segment other than a runner. A suitable carrying case shall be furnished.

Mandrel testing shall be conducted by the contractor in the presence of the engineer. Mandrel testing shall be at no direct pay.

2.3 CONCRETE PIPE AND FITTINGS

1. Reinforced-Concrete Sewer Pipe and Fittings: Conforming to LA DOTD Standard Specification for Roads and Bridges, Section 701 and referenced Sections, for materials, fittings and connections required for Storm Drain Pipe. NONPRESSURE-TYPE PIPE COUPLINGS
2. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
3. Sleeve Materials:
 - a. For Concrete Pipes: ASTM C 443, rubber.
 - b. For Plastic Pipes: ASTM F 477, elastomeric seal
 - c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.4 BUSHING TYPE PIPE COUPLINGS

- A. Material for Concrete Pipe: ASTM 443, rubber
- B. Material for Plastic Pipe: ASTM F 477, elastomeric seal.

2.5 CATCH BASINS

- A. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
 1. Bottom & Top: Reinforced concrete.
 2. Walls, 8"w. x 4" ht. x 16"long precast concrete blocks laid in type S mortar. With parged walls.
 3. Walls – Reinforced Concrete.
- B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
 1. Size: 36 by 36 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- C. Frames and Grates: Heavy Duty Cast Iron grates with Cast Iron Frames for heavy duty use approved by LA DOTD
 1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- D. Pre-Cast Concrete Catch Basins: Design Standard LA DOTD.

2.6 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy-duty frames and grates according to utility standards.
- E. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.
See Division 5 Section "Gratings" for fabricated-steel grating.

2.7 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregular size and shape, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-4, screen opening 3 inches.
- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size, graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

2.8 POURED IN PLACE CONCRETE

- A. Concrete shall be 5.2 bag standard mix and achieve a minimum of 3,750psi in 28 days
- B. Reinforcing shall be 6 x6 6/6 wwf flat sheets held up from grade on plastic chairs and overlapped and tied.
- C. Finish concrete with a trowel finish followed by a light broom.
- D. Immediately after concrete has set apply a curing compound at rate recommended by manufacturer.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

A. Include joints as required by LA DOTD specifications for Storm Drain Pipe and Storm Drain Pipe Arch, or Cross Drain Pipe and Corss Drain Pipe Arch unless otherwise indicated.

B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install piping with 12 inch minimum cover.
Retain subparagraph above or first subparagraph below.
3. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
4. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.4 PIPE JOINT CONSTRUCTION

A. Include joints as required by LA DOTD specifications for Storm Drain Pipe and Storm Drain Pipe Arch, or Cross Drain Pipe and Cross Drain Pipe Arch unless otherwise indicated.

B. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
2. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.5 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 STORMWATER INLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.7 CONCRETE

- A. Place cast-in-place concrete according to ACI 318/318R. and the following:
 - 1. Cement ASTM C 150, Type II
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable
- B. Portland Design Mix. 4,000psi, with 0.45 maximum water-cementitious ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

3.8 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction and replacement include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.Retain test in first subparagraph and associated subparagraphs below only if required.

5. Gravity-Flow Storm Drainage Piping: Test according to requirements of LA DOTD.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 33 41 5



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Envelope Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**

Project Title: 24-295 COHN ELEM BUILD

Project Type: New Construction

Construction Site:

805 14TH ST
PORT ALLEN, Louisiana 70767

Owner/Agent:

Chad Fontenot
WBR Schools
3761 Rosedale Rd
Port Allen, Louisiana 70767
225-343-9309
chad.fontenot@wbrschools.net

Designer/Contractor:

SCOTT WELCH
10705 RIEGER ROAD
Baton Rouge, Louisiana 70809
2252939474
scott@tlaeng.com

Building Location (for weather data):

Climate Zone:

Port Allen, Louisiana

2a

Building Use: Activity Type(s)

1-School/University : Nonresidential

2-Workshop : Nonresidential

Floor Area

23115

1290

Section 2: Envelope Assemblies and Requirements Checklist

Envelope TBD: All building area types must be assigned to at least one envelope assembly

Envelope Assemblies:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R- Value	Proposed U-Factor	Budget U- Factor ^(a)

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

- ☐ 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.
- ☐ 2. Windows, doors, and skylights certified as meeting leakage requirements.
- ☐ 3. Component R-values & U-factors labeled as certified.
- ☐ 4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- ☐ 5. 'Other' components have supporting documentation for proposed U-Factors.
- ☐ 6. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.
- ☐ 7. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.
- ☐ 8. Cargo doors and loading dock doors are weather sealed.
- ☐ 9. Recessed lighting fixtures installed in the building envelope are Type IC rated as meeting ASTM E283, are sealed with gasket or caulk.



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Mechanical Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**

Project Title: 24-295 COHN ELEM BUILD

Project Type: New Construction

Construction Site:

805 14TH ST
PORT ALLEN, Louisiana 70767

Owner/Agent:

Chad Fontenot
WBR Schools
3761 Rosedale Rd
Port Allen, Louisiana 70767
225-343-9309
chad.fontenot@wbrschools.net

Designer/Contractor:

SCOTT WELCH
10705 RIEGER ROAD
Baton Rouge, Louisiana 70809
2252939474
scott@tlaeng.com

Section 2: General Information

Building Location (for weather data):

Port Allen, Louisiana

Climate Zone:

2a

Section 3: Mechanical Systems List

Quantity System Type & Description

- 1 HVAC System (Multiple-Zone) :
Cooling: 1 each - Hydronic Coil, Capacity = 503 kBtu/h, Unknown Economizer
No minimum efficiency requirement applies
- 1 HVAC System (Multiple-Zone) :
Cooling: 1 each - Hydronic Coil, Capacity = 546 kBtu/h, Unknown Economizer
No minimum efficiency requirement applies
- 2 HVAC System (Single Zone) : Split System Heat Pump
Heating Mode: Capacity = 12 kBtu/h,
Proposed Efficiency = 8.00 HSPF, Required Efficiency = 7.70 HSPF
Cooling Mode: Capacity = 12 kBtu/h,
Proposed Efficiency = 16.00 SEER, Required Efficiency = 13.00 SEER
Proposed Part Load Efficiency = 0.00 , Required Part Load Efficiency = 0.00
- 2 Plant:
Cooling: Water Chiller, Capacity 140 tons, Condenser Air-Cooled, Rotary Screw or Scroll Chiller
Proposed Efficiency: 9.78 EER, Required Efficiency: 9.56 EER
Proposed Part Load Efficiency: 16.90 IPLV, Required Part Load Efficiency: 12.50 IPLV
- 2 Water Heater:
Electric Storage Water Heater, Capacity: 80 gallons w/ Circulation Pump
Proposed Efficiency: 0.91 EF, Required Efficiency: 0.82 EF

Section 4: Requirements Checklist

Requirements Specific To: HVAC System :

- ☐ 1. Minimum one temperature control device per zone
 - ☐ 2. Balancing and pressure test connections on all hydronic terminal devices
 - ☐ 3. Systems serving more than one zone must be VAV systems
 - ☐ 4. Single-duct VAV terminals reduce primary air before reheating
 - ☐ 5. Controls capable of resetting supply air temp (SAT) by 25% of SAT-room temp difference
- Exception(s):
- ☐ Systems that prevent reheating, recooling or mixing of heated and cooled supply air

- ☐ Seventy five percent of the energy for reheating is from site-recovered or site solar energy sources.
- ☐ Zones with peak supply air quantities of 300 cfm (142 L/s) or less.
- ☐ 6. VAV fans with static pressure sensors are placed in a position such that the controller setpoint is no greater than one-third the total design fan static pressure. If placement results in the sensor being located downstream of major duct splits, multiple sensors are installed in each major branch.
Exception(s):
 - ☐ Systems with DDC of individual zone boxes reporting to the central control panel and reset of static pressure setpoint based on the zone requiring the most pressure.
- ☐ 7. Systems with DDC of individual zone boxes reporting to the central control panel has static pressure setpoint reset based on the zone requiring the most pressure.
- ☐ 8. Meets the condenser heat recovery requirement for service water heating
Exception(s):
 - ☐ Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
 - ☐ Facilities that provide 60% of their service water heating from site solar or site recovered energy or from other sources.
- ☐ 9. Chilled water pumping systems with multiple chillers must automatically reduce chilled water flow rates proportionately when chillers are not operating

Requirements Specific To: HVAC System :

- ☐ 1. Minimum one temperature control device per zone
- ☐ 2. Balancing and pressure test connections on all hydronic terminal devices
- ☐ 3. Systems serving more than one zone must be VAV systems
- ☐ 4. Single-duct VAV terminals reduce primary air before reheating
- ☐ 5. Controls capable of resetting supply air temp (SAT) by 25% of SAT-room temp difference
Exception(s):
 - ☐ Systems that prevent reheating, recooling or mixing of heated and cooled supply air
 - ☐ Seventy five percent of the energy for reheating is from site-recovered or site solar energy sources.
 - ☐ Zones with peak supply air quantities of 300 cfm (142 L/s) or less.
- ☐ 6. VAV fans with static pressure sensors are placed in a position such that the controller setpoint is no greater than one-third the total design fan static pressure. If placement results in the sensor being located downstream of major duct splits, multiple sensors are installed in each major branch.
Exception(s):
 - ☐ Systems with DDC of individual zone boxes reporting to the central control panel and reset of static pressure setpoint based on the zone requiring the most pressure.
- ☐ 7. Systems with DDC of individual zone boxes reporting to the central control panel has static pressure setpoint reset based on the zone requiring the most pressure.
- ☐ 8. Meets the condenser heat recovery requirement for service water heating
Exception(s):
 - ☐ Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
 - ☐ Facilities that provide 60% of their service water heating from site solar or site recovered energy or from other sources.
- ☐ 9. Chilled water pumping systems with multiple chillers must automatically reduce chilled water flow rates proportionately when chillers are not operating

Requirements Specific To: HVAC System :

- ☐ 1. Equipment minimum efficiency: Heat Pump: 7.70 HSPF 13.00 SEER

Requirements Specific To: Plant :

- ☐ 1. Equipment minimum efficiency: Chiller: 9.562 EER + 12.50 IPLV
- ☐ 2. Hot gas bypass prohibited unless system has multiple steps of unloading or continuous capacity modulation
- ☐ 3. Hot gas bypass limited to 50% of total cooling capacity
- ☐ 4. Meets the condenser heat recovery requirement for service water heating
Exception(s):
 - ☐ Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
 - ☐ Facilities that provide 60% of their service water heating from site solar or site recovered energy or from other sources.
- ☐ 5. Chilled water pumping systems with multiple chillers must automatically reduce chilled water flow rates proportionately when chillers are not operating

Requirements Specific To: Water Heater :

- ☐ 1. Water heating equipment meets minimum efficiency requirements: Electric Water Heater efficiency: 0.82 EF (333 SL, Btu/h (if > 12 kW))

- ☐ 2. All piping in circulating system insulated
- ☐ 3. Hot water storage temperature controls that allow setpoint of 90°F for non-dwelling units and 110°F for dwelling units.
- ☐ 4. Automatic time control of heat tapes and recirculating systems present
- ☐ 5. Controls will shut off operation of circulating pump between water heater/boiler and storage tanks within 5 minutes after end of heating cycle

Generic Requirements: Must be met by all systems to which the requirement is applicable:

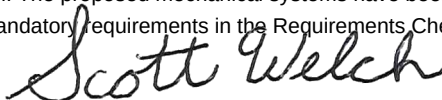
- ☐ 1. Plant equipment and system capacity no greater than needed to meet loads
Exception(s):
 - ☐ Standby equipment automatically off when primary system is operating
 - ☐ Multiple units controlled to sequence operation as a function of load
- ☐ 2. Minimum one temperature control device per system
- ☐ 3. Minimum one humidity control device per installed humidification/dehumidification system
- ☐ 4. Load calculations per ASHRAE/ACCA Standard 183.
- ☐ 5. Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup
Exception(s):
 - ☐ Continuously operating zones
- ☐ 6. Outside-air source for ventilation; system capable of reducing OSA to required minimum
- ☐ 7. R-5 supply and return air duct insulation in unconditioned spaces
R-8 supply and return air duct insulation outside the building
R-8 insulation between ducts and the building exterior when ducts are part of a building assembly
Exception(s):
 - ☐ Ducts located within equipment
 - ☐ Ducts with interior and exterior temperature difference not exceeding 15°F.
- ☐ 8. Mechanical fasteners and sealants used to connect ducts and air distribution equipment
- ☐ 9. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastics
- ☐ 10. Hot water pipe insulation: 1.5 in. for pipes ≤1.5 in. and 2 in. for pipes >1.5 in.
Chilled water/refrigerant/brine pipe insulation: 1.5 in. for pipes ≤1.5 in. and 1.5 in. for pipes >1.5 in.
Steam pipe insulation: 1.5 in. for pipes ≤1.5 in. and 3 in. for pipes >1.5 in.
Exception(s):
 - ☐ Piping within HVAC equipment.
 - ☐ Fluid temperatures between 55 and 105°F.
 - ☐ Fluid not heated or cooled with renewable energy.
 - ☐ Piping within room fan-coil (with AHRI440 rating) and unit ventilators (with AHRI840 rating).
 - ☐ Runouts <4 ft in length.
- ☐ 11. Operation and maintenance manual provided to building owner
- ☐ 12. Thermostatic controls have 5°F deadband
Exception(s):
 - ☐ Thermostats requiring manual changeover between heating and cooling
 - ☐ Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.
- ☐ 13. Balancing devices provided in accordance with IMC 603.17
- ☐ 14. Demand control ventilation (DCV) present for high design occupancy areas (>40 person/1000 ft² in spaces >500 ft²) and served by systems with any one of 1) an air-side economizer, 2) automatic modulating control of the outdoor air damper, or 3) a design outdoor airflow greater than 3000 cfm.
Exception(s):
 - ☐ Systems with heat recovery.
 - ☐ Multiple-zone systems without DDC of individual zones communicating with a central control panel.
 - ☐ Systems with a design outdoor airflow less than 1200 cfm.
 - ☐ Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1200 cfm.
- ☐ 15. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings
Exception(s):
 - ☐ Gravity dampers acceptable in buildings <3 stories
- ☐ 16. Automatic controls for freeze protection systems present
- ☐ 17. Three-pipe systems not used
- ☐ 18. Exhaust air heat recovery included for systems 5,000 cfm or greater with more than 70% outside air fraction or specifically exempted
Exception(s):
 - ☐ Hazardous exhaust systems, commercial kitchen and clothes dryer exhaust systems that the International Mechanical Code prohibits the use of energy recovery systems.

- ☐ Systems serving spaces that are heated and not cooled to less than 60°F.
- ☐ Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
- ☐ Heating systems in climates with less than 3600 HDD.
- ☐ Cooling systems in climates with a 1 percent cooling design wet-bulb temperature less than 64°F.
- ☐ Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
- ☐ Laboratory fume hood exhaust systems that have either a variable air volume system capable of reducing exhaust and makeup air volume to 50 percent or less of design values or, a separate make up air supply meeting the following makeup air requirements:
 - a) at least 75 percent of exhaust flow rate, b) heated to no more than 2°F below room setpoint temperature, c) cooled to no lower than 3°F above room setpoint temperature, d) no humidification added, e) no simultaneous heating and cooling.

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2009 IECC requirements in COMcheck-Web and to comply with the mandatory requirements in the Requirements Checklist.

Scott Welch, PE



7/1/25

Name - Title

Signature

Date

Section 6: Post Construction Compliance Statement

- ☐ HVAC record drawings of the actual installation, system capacities, calibration information, and performance data for each equipment provided to the owner.
- ☐ HVAC O&M documents for all mechanical equipment and system provided to the owner by the mechanical contractor.
- ☐ Written HVAC balancing and operations report provided to the owner.

The above post construction requirements have been completed.

Principal Mechanical Designer-Name

Signature

Date



COMcheck Software Version COMcheckWeb

Interior Lighting Compliance Certificate

Project Information

Energy Code: 2021 IECC
Project Title: Cohn Elementary Building
Project Type: New Construction

Construction Site:
805 14th Street
Port Allen, Louisiana 70767

Owner/Agent:
Chad Fontenot
WBR Schools
3761 Rosedale Rd.
Port Allen, Louisiana 70767
225-343-8309
chad.fontenot@wbrschools.net

Designer/Contractor:
John Hobbs
Forte and Tablada, Inc.
9107 Interline Avenue
Baton Rouge, Louisiana 70809
225-927-9321
hobbsj@forteandtablada.com

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft ²)	C Allowed Watts / ft ²	D Allowed Watts
1-School/University	23115	0.72	16643
Total Allowed Watts =			16643

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
1-School/University				
LED: A: 2 x4 Lay-In: Other:	1	148	49	7252
LED: B: 4' Decorative Strip: Other:	1	49	32	1568
LED: C: 2 x 2 Surface: Other:	1	68	41	2788
LED: D: 8' Decorative Strip: Other:	1	8	64	512
LED: J: 8' Utility Strip: Other:	1	6	64	384
Total Proposed Watts =				12504

Interior Lighting PASSES: Design 25% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2021 IECC requirements in COMcheck Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

JOHN E. HOBBS, SR. PROJ. MGR.
Name - Title

John E. Hobbs
Signature

7-1-2025
Date



COMcheck Software Version COMcheckWeb

Inspection Checklist

Energy Code: 2021 IECC

Requirements: 100.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR4] ¹	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C406 [PR9] ¹	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.3.1 [EL22] ¹	Spaces required to have light-reduction controls have a manual control that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern ≥ 50 percent.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1.1 C405.2.1.1 1 [EL18] ¹	Occupancy sensors installed in classrooms/lecture/training rooms, conference/meeting/multipurpose rooms, copy/print rooms, lounges/breakrooms, enclosed offices, open plan office areas, restrooms, storage rooms, locker rooms, corridors, warehouse storage areas, and other spaces ≤ 300 sqft that are enclosed by floor-to-ceiling height partitions. Reference section language C405.2.1.2 for control function in warehouses and section C405.2.1.3 for open plan office spaces.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1.2 2 [EL19] ¹	Occupancy sensors control function in warehouses: In warehouses, the lighting in aiseways and open areas is controlled with occupant sensors that automatically reduce lighting power by 50% or more within 20 minutes of when the areas are unoccupied. The occupant sensors control lighting in each aisleway independently and do not control lighting beyond the aisleway being controlled by the sensor. Lights not turned off by occupant sensors is done so by time-switch.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.1.3 3 [EL20] ¹	Occupant sensor control function in open plan office areas: Occupant sensor controls in open office spaces ≥ 300 sq.ft. have controls 1) configured so that general lighting can be controlled separately in control zones with floor areas ≤ 600 sq.ft. within the space, 2) general lighting in each zone permitted to turn on upon occupancy in control zone, 3) automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the space, 4) are configured so that general lighting power in each control zone is reduced by $\geq 80\%$ of the full zone general lighting power within 20 minutes of all occupants leaving that control zone.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.2.1 C405.2.2.1 1 [EL21] ²	Each area not served by occupancy sensors (per C405.2.1.1) have time-switch controls and functions detailed in sections C405.2.2.1.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.4, C405.2.4.1, C405.2.4.2 [EL23] ²	Daylight zones provided with individual controls that control the lights independent of general area lighting. See code section C405.2.3 Daylight-responsive controls for applicable spaces, C405.2.3.1 Daylight responsive control function and section C405.2.3.2 Sidelit zone.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.2.5 [EL27] ¹	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.7 [EL26] ²	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.8 [EL27] ²	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.9.1, C405.9.2 [EL28] ²	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Exception: Requirement does not apply.
C405.10 [EL29] ²	Total voltage drop across the combination of feeders and branch circuits $\leq 5\%$.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C405.1.1 [EL30] ²	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy ≥ 65 lm/W or luminaires with efficacy ≥ 45 lm/W or comply with C405.2.4 or C405.3.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Exception: Requirement does not apply.
C405.11, C405.11.1 [EL31] ²	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and $> 25\%$ of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.11.1.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Exception: Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.2 [FI17] ³	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.1.1 [FI57] ¹	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.2.5 [FI16] ³	Furnished as-built drawings for electric power systems within 90 days of system acceptance.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.
C408.3 [FI33] ¹	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)



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Envelope Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**

Project Title: Cohn Elementary PH 1

Project Type: New Construction

Construction Site:

805 14TH ST.
Port Allen, Louisiana 70767

Owner/Agent:

Chad Fontenot
WBR Schools
3761 Rosedale Rd.
Port Allen, Louisiana 70767
225-343-8309
chad.fontenot@wbrschools.net

Designer/Contractor:

Jeremy Lucas
BCB Architects
P.O. Box 213
Plaquemine, Louisiana 70767
225-235-4754
jeremy@bcbapc.com

Building Location (for weather data):

Climate Zone:

Vertical Glazing / Wall Area Pct.:

Port Allen, Louisiana

2a

20%

Building Use: Activity Type(s)

1-School/University : Nonresidential

2-Workshop : Nonresidential

Floor Area

23115

1290

Section 2: Envelope Assemblies and Requirements Checklist

Envelope PASSES: Design 2% better than code.

Envelope Assemblies:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor ^(a)
Floor: Unheated Slab-On-Grade, [Bldg. Use 1 - School/University]	1000	---	---	---	---
Floor: Unheated Slab-On-Grade, [Bldg. Use 2 - Workshop]	146	---	---	---	---
Roof: Insulation Entirely Above Deck, [Bldg. Use 1 - School/University]	23115	---	30.0	0.032	0.048
Roof: Metal Building, Standing Seam, [Bldg. Use 2 - Workshop]	1290	19.0	0.0	0.065	0.055
Ext. Wall: Steel-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	12000	19.0	9.8	0.053	0.124
Window: Metal Frame, Thermal Break, Perf. Type: Energy code default, Double Pane with Low-E, Clear, SHGC 0.70, PF 5.00, [Bldg. Use 1 - School/University]	2800	---	---	0.650	0.750
Door: Insulated Metal, Swinging, [Bldg. Use 1 - School/University]	294	---	---	0.650	0.700
Ext. Wall: Metal Building Wall, Single Layer Mineral Fiber (compressed at girt), [Bldg. Use 2 - Workshop]	1752	19.0	0.0	0.113	0.093
Door: Insulated Metal, Swinging, [Bldg. Use 2 - Workshop]	148	---	---	0.650	0.700

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

- ☐ 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.
- ☐ 2. Windows, doors, and skylights certified as meeting leakage requirements.
- ☐ 3. Component R-values & U-factors labeled as certified.
- ☐ 4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- ☐ 5. 'Other' components have supporting documentation for proposed U-Factors.
- ☐ 6. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.

- ☐ 7. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.
- ☐ 8. Cargo doors and loading dock doors are weather sealed.
- ☐ 9. Recessed lighting fixtures installed in the building envelope are Type IC rated as meeting ASTM E283, are sealed with gasket or caulk.

Section 3: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2009 IECC requirements in *COMcheck-Web* and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title

Signature

Date



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Interior Lighting Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**

Project Title: Cohn Elementary PH 1

Project Type: New Construction

Construction Site:

805 14TH ST.
Port Allen, Louisiana 70767

Owner/Agent:

Chad Fontenot
WBR Schools
3761 Rosedale Rd.
Port Allen, Louisiana 70767
225-343-8309
chad.fontenot@wbrschools.net

Designer/Contractor:

Jeremy Lucas
BCB Architects
P.O. Box 213
Plaquemine, Louisiana 70767
225-235-4754
jeremy@bcbapc.com

Section 2: Interior Lighting and Power Calculation

A Area Category	B Floor Area (ft ²)	C Allowed Watts / ft ²	D Allowed Watts (B x C)
School/University	23115	1.2	27738
Workshop	1290	1.4	1806
Total Allowed Watts =			29544

Section 3: Interior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
School/University (23115 sq.ft.)				
Workshop (1290 sq.ft.)				
Total Proposed Watts =				0

Section 4: Requirements Checklist

Interior Lighting TBD: No lighting fixtures specified

Lighting Wattage:

- ☐ 1. Total proposed watts must be less than or equal to total allowed watts.

Allowed Watts	Proposed Watts	Complies
29544	0	YES

Controls, Switching, and Wiring:

- ☐ 2. Daylight zones under skylights more than 15 feet from the perimeter have lighting controls separate from daylight zones adjacent to vertical fenestration.
- ☐ 3. Daylight zones have individual lighting controls independent from that of the general area lighting.

Exceptions:

- ☐ Contiguous daylight zones spanning no more than two orientations are allowed to be controlled by a single controlling device.
- ☐ Daylight spaces enclosed by walls or ceiling height partitions and containing two or fewer light fixtures are not required to have a separate switch for general area lighting.

- ☐ 4. Independent controls for each space (switch/occupancy sensor).

Exceptions:

- ☐ Areas designated as security or emergency areas that must be continuously illuminated.
- ☐ Lighting in stairways or corridors that are elements of the means of egress.
- ☐ 5. Master switch at entry to hotel/motel guest room.
- ☐ 6. Individual dwelling units separately metered.
- ☐ 7. Medical task lighting or art/history display lighting claimed to be exempt from compliance has a control device independent of the control of the nonexempt lighting.
- ☐ 8. Each space required to have a manual control also allows for reducing the connected lighting load by at least 50 percent by either controlling all luminaires, dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps, switching the middle lamp luminaires independently of other lamps, or switching each luminaire or each lamp.

Exceptions:

- ☐ Only one luminaire in space.
- ☐ An occupant-sensing device controls the area.
- ☐ The area is a corridor, storeroom, restroom, public lobby or sleeping unit.
- ☐ Areas that use less than 0.6 Watts/sq.ft.
- ☐ 9. Automatic lighting shutoff control in buildings larger than 5,000 sq.ft.

Exceptions:

- ☐ Sleeping units, patient care areas; and spaces where automatic shutoff would endanger safety or security.
- ☐ 10. Photocell/astronomical time switch on exterior lights.

Exceptions:

- ☐ Lighting intended for 24 hour use.
- ☐ 11. Tandem wired one-lamp and three-lamp ballasted luminaires (No single-lamp ballasts).

Exceptions:

- ☐ Electronic high-frequency ballasts; Luminaires on emergency circuits or with no available pair.



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Exterior Lighting Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
Project Title: Cohn Elementary PH 1
Project Type: New Construction
Exterior Lighting Zone: 0 (Unspecified)

Construction Site:
805 14TH ST.
Port Allen, Louisiana 70767

Owner/Agent:
Chad Fontenot
WBR Schools
3761 Rosedale Rd.
Port Allen, Louisiana 70767
225-343-8309
chad.fontenot@wbrschools.net

Designer/Contractor:
Jeremy Lucas
BCB Architects
P.O. Box 213
Plaquemine, Louisiana 70767
225-235-4754
jeremy@bcbapc.com

Section 2: Exterior Lighting Area/Surface Power Calculation

A Exterior Area/Surface	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B x C)	F Proposed Watts
Total Tradable Watts* =				0	0
Total Allowed Watts =				0	
Total Allowed Supplemental Watts** =				500	

* Wattage tradeoffs are only allowed between tradable areas/surfaces.

** A supplemental allowance equal to 500 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Section 3: Exterior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Total Tradable Proposed Watts =				0

Section 4: Requirements Checklist

Lighting Wattage:

- ☐ 1. Within each non-tradable area/surface, total proposed watts must be less than or equal to total allowed watts. Across all tradable areas/surfaces, total proposed watts must be less than or equal to total allowed watts.

Compliance: Exterior lighting zone not specified (see project screen)

Controls, Switching, and Wiring:

- ☐ 2. All exemption claims are associated with fixtures that have a control device independent of the control of the nonexempt lighting.
- ☐ 3. Lighting not designated for dusk-to-dawn operation is controlled by either a photosensor (with time switch), or an astronomical time switch.
- ☐ 4. Lighting designated for dusk-to-dawn operation is controlled by an astronomical time switch or photosensor.
- ☐ 5. All time switches are capable of retaining programming and the time setting during loss of power for a period of at least 10 hours.

Exterior Lighting Efficacy:

- ☐ 6. All exterior building grounds luminaires that operate at greater than 100W have minimum efficacy of 60 lumen/watt.

Exceptions:

- ☐ Lighting that has been claimed as exempt and is identified as such in Section 3 table above.
- ☐ Lighting that is specifically designated as required by a health or life safety statute, ordinance, or regulation.
- ☐ Emergency lighting that is automatically off during normal building operation.
- ☐ Lighting that is controlled by motion sensor.

Exterior Lighting TBD: Exterior lighting zone not specified (see project screen)



Generated by COMcheck-Web Software

Mechanical Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**

Project Title: Cohn Elementary PH 1

Project Type: New Construction

Construction Site:

805 14TH ST.
Port Allen, Louisiana 70767

Owner/Agent:

Chad Fontenot
WBR Schools
3761 Rosedale Rd.
Port Allen, Louisiana 70767
225-343-8309
chad.fontenot@wbrschools.net

Designer/Contractor:

Jeremy Lucas
BCB Architects
P.O. Box 213
Plaquemine, Louisiana 70767
225-235-4754
jeremy@bcbapc.com

Section 2: General Information

Building Location (for weather data):

Port Allen, Louisiana
2a

Climate Zone:

Section 3: Mechanical Systems List

Quantity System Type & Description

Section 4: Requirements Checklist

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2009 IECC requirements in COMcheck-Web and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title

Signature

Date

Section 6: Post Construction Compliance Statement

- ☐ HVAC record drawings of the actual installation, system capacities, calibration information, and performance data for each equipment provided to the owner.
- ☐ HVAC O&M documents for all mechanical equipment and system provided to the owner by the mechanical contractor.
- ☐ Written HVAC balancing and operations report provided to the owner.

The above post construction requirements have been completed.

Principal Mechanical Designer-Name

Signature

Date

Cohn Elementary

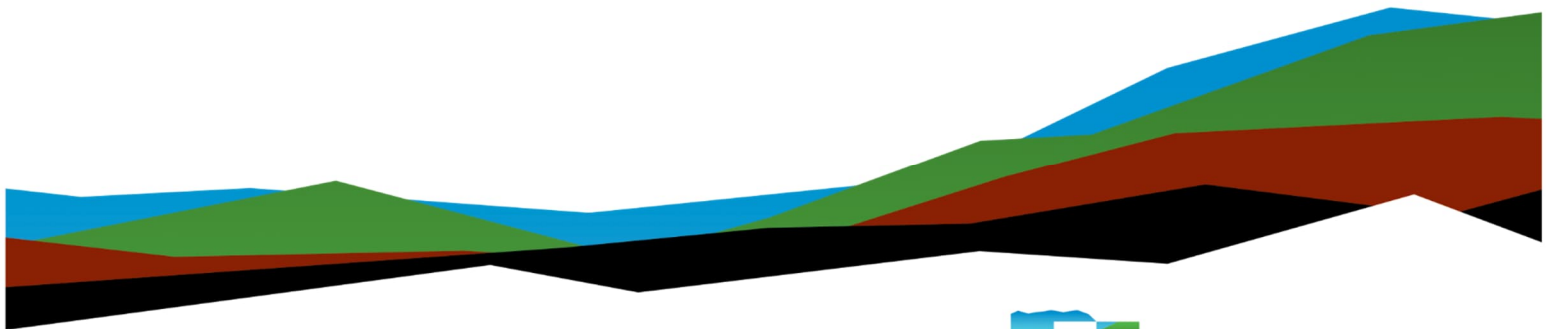
Geotechnical Engineering Report

April 16, 2025 | Terracon Project No. EH255033

Port Allen, Louisiana

Prepared for:

BCB Architects LLC
3488 Brentwood Drive
Baton Rouge, LA 70809



Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials



2822 O'Neal Lane Building B
Baton Rouge, LA 70816
P (225) 344-6052
Terracon.com

April 16, 2025

BCB Architects LLC
3488 Brentwood Drive
Baton Rouge, LA 70809

Attn: Jeremy Lucas
P: (225) 235-4754
E: Jeremy@bcbapc.com

Re: Geotechnical Engineering Report
Cohn Elementary
805 14th St
Port Allen, Louisiana
Terracon Project No. EH255033

Dear Mr. Lucas:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PEH255033 dated February 19, 2025. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon



Ryan E. Poindexter, P.E.

Project Engineer

Albert Ayenu-Prah, Jr.

Review By: Albert Y. Ayenu-Prah, Jr., Ph.D., P.E. -
Senior Engineer

Lynne E. Roussel, P.E.

Senior Principal | Office Manager

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Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

Refer to each individual Attachment for a listing of contents.



Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed building and pavement to be located at 805 14th St in Port Allen, Louisiana. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Pavement design and construction
- Stormwater pond considerations

The geotechnical engineering Scope of Services for this project included the advancement of test borings, CPTs, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the [Site Location](#) and [Exploration Plan](#), respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and as separate graphs in the [Exploration Results](#) section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	An email request for proposal was provided by Jeremy Lucas with BCB on February 11, 2025. The request included a Parcel Map, a Google Earth image of the site, and conceptual plan drawings of the layout of the planned development. A follow up email was provided by Jeremy Lucas with BCB on February 18, 2025 with an updated loading and boring plan from the structural engineer.

Item	Description
Project Description	The project includes construction of a school. The development includes 4 new 1-story classroom buildings and a pre-engineered metal building gymnasium.
Building Construction	The superstructure framing will consist of either loadbearing CMU or cold-formed steel walls with cold-formed steel roof trusses.
Finished Floor Elevation	Boring depths have assumed that finished floor is not more than 2 feet above existing grade.
Maximum Loads	Anticipated structural loads were provided. ■ Columns: 65 to 80 kips ■ Walls: 1.4 to 2.5 kips per linear foot (klf) ■ Slabs: 100 pounds per square foot (psf) live load
Grading/ Slopes	Approximately 2 feet of fill will be required to develop final grade, excluding remedial grading requirements.
Pavements	A preferred pavement surfacing has not been identified to us as part of the preliminary information. Asphalt/Concrete surfacing is common in the area for projects of this nature and is the assumed preference. Unless information is provided prior to the report, the anticipated ACI traffic categories and daily truck traffic will be assumed to consist of: ■ Car parking areas and access lanes, 300 vehicles per day ■ Entrance and truck service lanes, 5 vehicles per week ■ Buses ■ Garbage or fire truck lanes The pavement design period is 20 years.

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

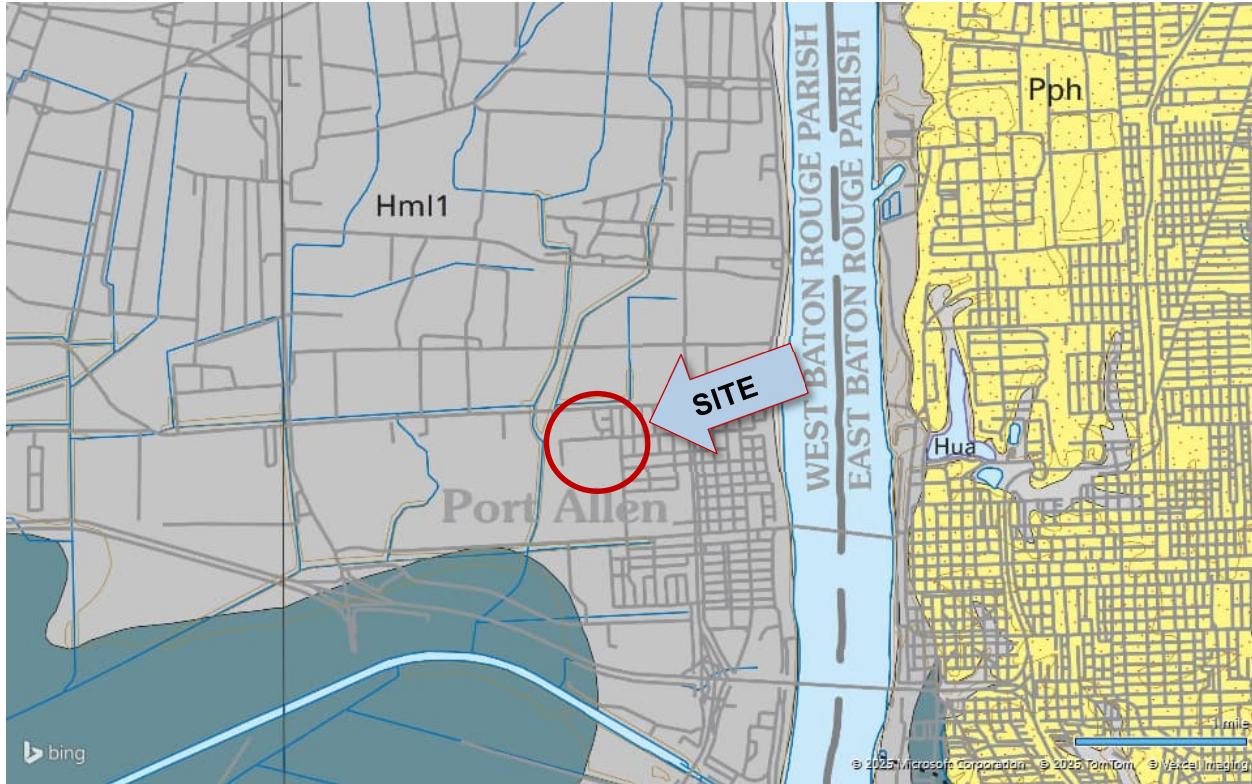
Item	Description

Parcel Information	The project is located at 805 14th St in Port Allen, Louisiana. Approximately 430 acres Latitude/Longitude (approximate): 30.45890° N 91.21804° W See Site Location
Existing Improvements	Existing Cohn Elementary building and associated paving.
Current Ground Cover	Concrete pavement at north-southeast of school building; grass and trees surrounding property.
Existing Topography	Relatively flat, with an average elevation of 17 feet, MSL.

Geotechnical Characterization

Surface Geology

The site is mapped in an area of Natural Levee deposits of Holocene Age very close to Backswamp deposits of Holocene Age. Natural Levee deposits (**Hm11**) consist of silty to clayey overbank deposits that compose the low natural levees flanking the Mississippi River meander-belt No.1. The Natural Levee deposits are broadly present throughout the area and are commonly characterized by firm to stiff clays and silty clays. At greater depth significant silt and sand layering may be present. Backswamp deposits (**Hb**) consist of fine-grained, usually clayey and often organically rich sediments that underlie flood basins between meander belts. Natural levee and backswamp deposits are somewhat variable, typically normally consolidated, and relatively weak and compressible. It is common to encounter a stiff and overconsolidated clay ‘crust’ near the ground surface that has formed from the effects of seasonal drying/desiccation. The sediments underlying the stiff surface “crust” typically consist of relatively soft clays and loose silts with layers of organic matter and wood. [The alluvial deposits overlay Pleistocene Age deposits.](#)



Baton Rouge 30x60 Minute Geologic Quadrangle (Louisiana Geological Survey, 2000)

Subsurface Conditions

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the [Exploration Results](#) and the GeoModel can be found in the [Figures](#) attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Near Surface Stiff Clays	Brown and gray, stiff to very stiff, occasionally medium stiff to stiff fat clay with gravel, sand, and ferrous nodules

2	Near Surface Soft Clays	Brown and gray soft to medium stiff, lean clay with occasional silt and sand pockets
3	Deeper Clays	Brown to gray, (very) soft to medium stiff lean clay (Layers in CPTs based on soil behavior type)
4	Clays with Sand Seams	Medium stiff to stiff lean/fat clays with silt and sand seams (Layers in CPTs based on soil behavior type)

The borings were advanced using a flight auger drilling technique that allow short term groundwater observations to be made while drilling. Groundwater conditions may be different at the time of construction. Mapping by the Natural Resources Conservation Service (NRCS) indicates a seasonal high groundwater level within 35 inches of ground surface. The value is the annual minimum, which is the nearest the water table gets to the surface of any significant component in the map unit at any time during the year. Groundwater conditions may change because of seasonal variations in rainfall, runoff, river levels and other conditions not apparent at the time of drilling. Long-term groundwater monitoring was outside the scope of services for this project. The table below provides the groundwater measurements at the time of drilling and after 15 minutes. As shown in the table below, some of the borings caved in after initial water readings were observed. The associated cave-in depth is recorded in the table for the applicable borings.

Locations	Initially Encountered (feet)	After 15 Minutes (feet)	Groundwater Not Encountered	Cave-in Depth
BC-01	--	--	X	--
BC-02	--	--	X	--
B-01	6	2 3/4	--	--
B-02	4	2	--	--
B-03	4	2	--	--
B-04	8	4	--	--
B-05	7	1	--	--
B-06	7	3 1/2	--	--
B-07	7	2 1/4	--	--
B-08	7	2	--	--
B-09	8	3	--	--
B-10	8	2	--	--

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties observed at the site and as described on the exploration logs and results, our professional opinion is that a **Seismic Site Classification of E** be considered for the project. Subsurface explorations at this site were extended to a maximum depth of 70 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Although not considered essential, additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Geotechnical Overview

The subsurface materials generally consisted of soft to medium stiff fat clays over stiff to very stiff fat clays. Groundwater was encountered during drilling at about 2 to 4 feet below existing grade.

The surface soils appeared relatively stable at the time of the exploration. However, the clays could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be completed early in the construction sequence and maintained after construction to reduce potential issues. At project sites with minimal grade change and with developments and roads surrounding the construction area, such as the existing school, it can be difficult to maintain positive drainage throughout the construction phase. The construction phase drainage should be considered in the development of the project overall grading and drainage plan. The possible poor drainage conditions can lead to instability in the areas around the site and hamper construction progress. A temporary dewatering system of sumps and pumps could be necessary to remove ponding water where positive drainage is not feasible.

If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Initial processing and drying of the upper native soils is anticipated in some areas to achieve suitable stability for subsequent fill placement. It can be prudent to consider specifying chemical treatment of critical project access roads and construction laydown areas as part of the construction package to reduce potential weather-related delays. Additional recommendations should be provided by the Geotechnical Engineer based on conditions

noted at the time of site preparation. Additional site preparation recommendations, including proofrolling, subgrade improvement and fill placement, are provided in the **Earthwork** section.

Based on the conditions encountered and estimated load-settlement relationships, the proposed structures can be supported on conventional continuous or spread footings, driven timber piles, or drilled piers. The soils which form the bearing stratum for shallow foundations are high plasticity fat clay. In general, lean clays are considered to exhibit low to moderate potential while fat clays are considered to exhibit a high potential for shrink-swell movements with changes in moisture. Maintaining a minimum dead load pressure on footings should reduce the anticipated swell movements to tolerable levels. The **Shallow Foundations** section addresses support of the building directly bearing on native stiff to very stiff lean/fat clay or structural fill. We do not expect significant dead load on the floors and recommend either placing a buffer layer of low plasticity structural fill or overexcavation and replacement of near-surface high plasticity clays or a combination of both methods to reduce the heave potential. The **Floor Slabs** section addresses slab-on-grade support of the building.

Due to the low strength and relatively high compressibility of the underlying soils, a deep foundation system of either drilled shafts or driven timber piles is recommended to support the planned structures. The **Deep Foundations** section addresses support of the building on drilled shafts or driven timber piles.

Our opinion of pavement section thickness design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein using methodology contained in NAPA IS-109 "Design of Hot Mix Asphalt Pavements" and ACI 330 "Guide to Design and Construction of Concrete Parking Lots" and adjusted with consideration to LADOTD Louisiana State Specification for Roads and Bridges (LSSRB 2016). The **Pavements** section includes minimum pavement component thickness.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Earthwork

Earthwork is anticipated to include demolition of existing pavements, clearing and grubbing, excavations, and structural fill placement. The following sections provide recommendations for use in the preparation of specifications for the work.

Recommendations include critical quality criteria, as necessary, to render the site in the

state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Demolition

We recommend existing foundations, slabs, old fills, utilities and other past site improvements be investigated and removed from within the proposed structure's footprint and at least 5 feet beyond the outer edge of foundations. The resulting excavations should be properly backfilled as outlined in this report.

For areas outside the proposed building footprints and foundation bearing zones, existing foundations, floor slabs, and utilities should be removed where they conflict with proposed utilities, retaining walls, and pavements. In such cases, existing foundations, floor slabs, and utilities should be removed to a depth of at least 2 feet below the affected utility or design pavement subgrade elevation.

Site Preparation

Prior to placing fill, the existing vegetation, topsoil, root mats and loose, soft or otherwise unsuitable material should be removed. Complete stripping of the topsoil should be performed in the proposed building and parking/driveway areas. Topsoil measurements were made at the boring locations; however, stripping depths between our boring locations and across the site could vary considerably. As such we recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material.

Subgrade Preparation

After stripping the site, the subgrade should be proofrolled with an adequately loaded rubber tire vehicle such as a partially-loaded tandem-axle dump truck or loaded scraper. The vehicle should weigh between 15 and 20 Tons (total vehicle weight). The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. If unstable subgrade is encountered after initial topsoil stripping, mitigation should be performed as described in the **Soil Stabilization** section. Unstable, isolated areas could either be removed or modified by treating with lime or cement as specified by the Geotechnical Engineer at the time of construction. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Soil Stabilization

The near surface clay soils are expected to become unstable with typical construction activities. Methods of subgrade improvement, as described below, could include scarification, drying and recompaction, chemical stabilization or removal of unstable materials and replacement with structural fill. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, availability and costs of materials, the size of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proofrolling operations, it could be stabilized using one of the methods outlined below.

- **Scarification and Recompaction** - It may be feasible to scarify, dry, and recompact the exposed lean clay soils in unstable areas that were observed during proofrolling. The upper maximum 12 inches of native subgrade should be processed by frequent windrowing with a dozer or plowing with a set of heavy duty disc harrows for at least three working days to achieve stable conditions for fill placement before consideration of other mitigation approaches. The windrowing and drying effort should be performed during a period with at least two days forecasted to be dry. The processed areas should be sealed with the dozer at the end of the day in case of overnight rain. Stabilizing subgrades by drying likely would not be achievable if the thickness of the unstable soil is greater than about 1 to 2 feet, if the unstable soil is at groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.
- **Chemical Treatment** – For higher plasticity or wet, unstable surficial soils, it may be prudent to consider specifying chemical treatment of critical project access roads, building pads and construction laydown areas as part of the construction package to reduce potential weather-related delays. For the typical near surface clay soils at this site, treatment of the subgrade with minimum 8% quick lime or 8% hydrated lime by volume to a depth of 12 inches should provide for a more weather resistant subgrade of these critical areas during the construction phase. The hazards of airborne particles during mixing blowing across the site or onto adjacent property should be considered. Additional testing could be needed to develop specific recommendations on determining the most suitable stabilizing agent and optimum amounts required to improve subgrade stability by blending with the site soils.
- **Undercut and Replacement** – The surficial soils consist of low plasticity lean clay and non-plastic silt to around 2 feet below grade. Even though the subgrade appeared relatively stable during the subsurface exploration, repetitive construction traffic over the on-site surficial soil will likely lead to softening and



disturbance of the exposed native subgrade. Additionally, this material has a narrow range of moisture contents where sufficient levels of compaction with stability can be achieved and then sustained during the compaction of the fill above. Even though leaving this material in place or reworking is possible and should be considered, an undercut and replacement or cement treatment of building pads, critical project access roads and construction laydown areas should be budgeted as an alternative in the construction package or carefully considered at the time of construction to reduce potential weather related delays. Additional recommendations should be provided by the Geotechnical Engineer based on conditions noted at the time of site preparation.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures, pavements or constructed slopes and other structural areas. General fill is material used to achieve grade outside of these areas, such as landscaped areas.

Reuse of On-Site Soil: Excavated on-site lean clay soil may be selectively reused as structural fill below foundations, pavements and landscaping areas. Excavated on-site fat clay soil is not suitable for reuse as Structural Fill without lime treatment due to difficult compaction characteristics, stability issues at higher moistures and shrink/swell potential. It can be used as backfill in the landscape areas without lime treatment. Fat clay (CH) soils should not be used within 3 feet of finished grade in building areas and 1 foot below finished grade in other structural fill areas.

Material property requirements for on-site lean clay soil for use as general fill and structural fill are noted in the table below:

Property	General Fill	Structural Fill
Composition	Free of deleterious material	Free of deleterious material
Sand content	Not limited	Not limited
Plasticity	Liquid Limit less than 45, Plasticity index greater than 10 and less than 25	

Property	General Fill	Structural Fill
GeoModel Layer Expected to be Suitable ^{1,2}	1, 2	2

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.
2. Fat clay (CH) soils should not be used within 3 feet of finished grade in building areas and 1 foot below finished grade in other structural fill areas.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris.

Soil Type ¹	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Soil	CL, SC	Liquid Limit less than 45, Plasticity index greater than 10 and less than 25
River Sand	SP, SP-SM	Less than 10% Passing No. 200 sieve
Aggregate Base	GP, GM	LADOTD No. 610 Crushed Limestone or similarly graded crushed recycled concrete. ²

1. Structural and general fill should consist of approved materials free of organic matter and debris. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site. Additional geotechnical consultation should be provided prior to use of uniformly graded gravel on the site.
2. Materials should meet the requirements of LSSRB Section 1033.03.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.	Same as structural fill

Item	Structural Fill	General Fill
Minimum Compaction Requirements ^{1,2,3}	95% of max. below foundations, floor slabs, and finished pavement subgrade. 100% of maximum dry density for aggregate base beneath pavement.	92% of max.
Water Content Range ¹	Low plasticity cohesive: -2% to +3% of optimum High plasticity cohesive: 0 to +4% of optimum Granular: -3% to +3% of optimum Aggregate Base: -2% to +2% of optimum	As required to achieve min. compaction requirements.

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. High plasticity cohesive fill should not be compacted to more than 100% of standard Proctor maximum dry density.
3. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254). Materials not amenable to density testing should be placed, compacted and conditioned at workable moisture levels to a stable condition observed without pumping when proofrolling by the Geotechnical Engineer or representative.

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with LADOTD or local public works specifications for the utility to be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

On-site materials are considered suitable for backfill cover of utility and pipe trenches, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of structural fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

At project sites with minimal grade change and with developments and roads surrounding the construction area, such as the existing school, it can be difficult to maintain positive drainage throughout the construction phase. The construction phase drainage should be considered in the development of the project overall grading and drainage plan. The possible poor drainage conditions can lead to instability in the areas around the building and hamper construction progress. The site grading and general contractor should consider their means and methods to maintain drainage during the construction phase. It is sometimes prudent to consider specifying chemical treatment of critical project access roads and construction laydown areas as part of the construction package to reduce potential weather-related delays as described above.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Trees or other vegetation whose root systems can remove excessive moisture from the subgrade and foundation soils should not be planted next to the structure. Trees and

shrubby should be kept away from the exterior edges of the foundation element a distance at least equal to 1.5 times their expected mature height.

Earthwork Construction Considerations

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompact prior to floor slab construction.

The groundwater table could affect overexcavation efforts, especially for overexcavation and replacement of lower strength soils. A temporary dewatering system consisting of sumps with pumps may be necessary to achieve the recommended depth of overexcavation depending on groundwater conditions at the time of construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for possible effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill/debris materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 100 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Shallow Foundations

If the site has been prepared in accordance with the requirements noted in [Earthwork](#), the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure ^{1, 2}	750 psf - (Isolated columns and continuous footings) foundations bearing upon undisturbed natural subgrade soils
Required Bearing Stratum ³	GeoModel Layer 1, undisturbed native soils or structural fill
Minimum Foundation Dimensions	Per IBC 1809.7
Ultimate Passive Resistance ⁴	250 pcf (cohesive backfill) 350 pcf (granular backfill)

Item	Description
(equivalent fluid pressures)	
Sliding Resistance ⁵	250 psf allowable cohesion (native/structural fill clay) 0.35 allowable coefficient of friction (granular material)
Minimum Embedment below Finished Grade ⁶	Exterior footings: 18 inches Interior footings: 12 inches
Estimated Total Settlement from Structural Loads ²	Less than about 1 inch
Estimated Differential Settlement ^{2, 7}	About 1/2 of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in [Project Description](#). Settlement is for structural loads and up to 2 feet of structural fill. Additional settlement of about 1/3 of an inch per foot of fill above 2 feet can be expected. Additional geotechnical consultation will be necessary if higher loads or fill heights are anticipated.
3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in [Earthwork](#).
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Assumes no hydrostatic pressure.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations. A factor of safety of 1.5 was applied to this value. For fine-grained materials, lateral resistance using cohesion should not exceed ½ the dead load.
6. Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

Design Parameters – Overturning and Uplift Loads

Shallow foundations subjected to overturning loads should be proportioned such that the resultant eccentricity is maintained in the center-third of the foundation (e.g., $e < b/6$, where b is the foundation width). This recommendation is intended to keep the entire foundation area in compression during the extreme lateral/overturning load event. Foundation oversizing may be required to satisfy this condition.

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils with consideration to the IBC basic load combinations.

Item	Description
Soil Moist Unit Weight	115 pcf
Soil Effective Unit Weight ¹	53 pcf
Soil weight included in uplift resistance	Soil included within the prism extending up from the top perimeter of the footing at an angle of 20 degrees from vertical to ground surface

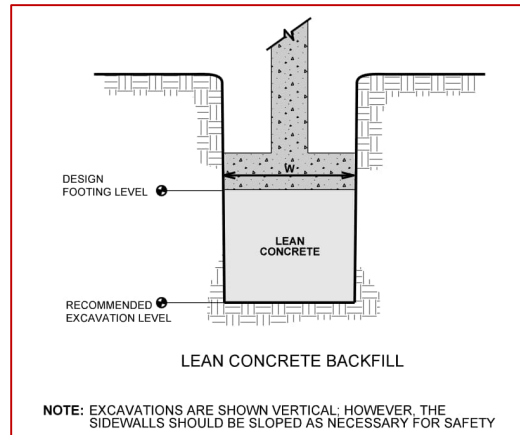
1. Effective (or buoyant) unit weight should be used for soil above the foundation level and below a water level. The high groundwater level should be used in uplift design as applicable.

Foundation Construction Considerations

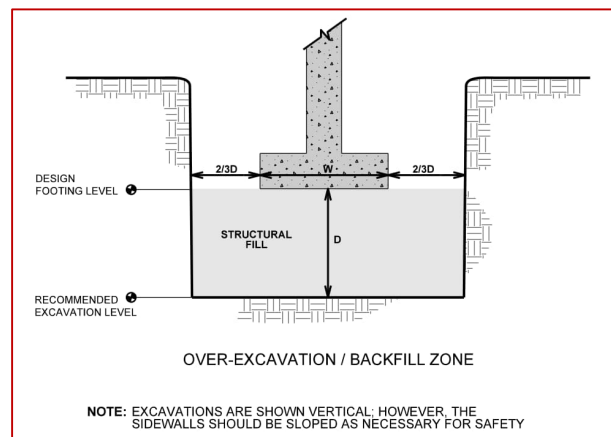
As noted in [Earthwork](#), the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

Sensitive soils exposed at the surface of footing excavations may require surficial compaction with hand-held dynamic compaction equipment prior to placing structural fill, steel, and/or concrete. Should surficial compaction not be adequate, construction of a working surface consisting of either crushed stone or a lean concrete mud mat may be required prior to the placement of reinforcing steel and construction of foundations.

If unsuitable bearing soils are observed at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The lean concrete replacement zone is illustrated on the sketch below.



Overexcavation for structural fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation, with structural soil fill or crushed stone wrapped in non-woven geotextile fabric placed, as recommended in the [Earthwork](#) section.



Deep Foundations

Drilled Concrete Shafts

Drilled concrete shafts are a common foundation system for the planned construction, and when suitably reinforced, are particularly efficient in resisting uplift and horizontal forces. The following paragraphs provide design recommendations and construction considerations for a drilled concrete shaft supported foundation system.

Axial Resistance

We have predicted the nominal (ultimate) compression and tension geotechnical resistance for various drilled concrete shaft diameters and depths for static load conditions using contributions from skin friction and end bearing. The nominal side friction resistance of the drilled concrete shafts was predicted for uncased conditions using published design approaches for calculation of skin friction including the alpha (α) method for cohesive soils and the β -method for cohesionless soils, assuming uncased construction. The skin friction resistance from the upper 4 feet of the shaft was neglected. The nominal end bearing resistance for the drilled concrete shaft was estimated using classic bearing capacity theory for cohesive soils and empirical correlations between corrected Standard Penetration Test (SPT) N_{60} values and the mobilized base resistance for cohesionless soils. If casing is used, the nominal compression and tension resistance in the tables below should be reduced by 10%.

The following table provides our recommendations for the nominal (ultimate) geotechnical resistance in kips for individual drilled shafts.

Drilled Shaft Axial Resistance Summary ¹

Pile Tip Depth ² (feet)	Nominal (Ultimate) Compression Resistance (tons)			Nominal (Ultimate) Tension Resistance (tons) ³		
	Shaft Diameter (inches)			Shaft Diameter (inches)		
	24	30	36	24	30	36
20	11	16	22	6	8	9
25	15	20	27	9	12	14
30	18	25	32	13	16	19
35	22	29	38	16	20	25
40	26	34	43	20	25	30
45	29	39	49	23	29	35
50	34	44	56	27	34	39

1. Design capacities are dependent upon the method of installation, and quality control during installation. The values provided are estimates and should be verified when installation protocols have been finalized.
2. Measured from assumed top of shaft elevation at existing grade.
3. Buoyant weight of shaft is included in nominal tension resistance.

The shaft resistances presented in the table above are the nominal (ultimate) geotechnical resistances and appropriate ASD factors of safety for the design should be established considering control methods specified to verify field capacity at the time of

construction. Provided below are the recommended factors of safety that can be considered for this project:

Field Capacity Verification Method	ASD Factor of Safety
Static Load Test on minimum 1 test shaft per structure (after verification that concrete is at design strength). Full-time observation of production shaft installation	2
No static load test, but full-time observation of production shaft installation.	2.5

The allowable tension capacity should be determined using a factor of safety of 3 unless a static tension load test is performed. Design capacities can be increased by 33% for highly transient loads such as wind loads, unless the transient loads have already been included in the factored design load (subject to verification of allowable structural capacity).

The structural capacity of the shafts should be evaluated by the structural engineer to assure that they can safely accommodate the combined stresses that may be induced by axial and lateral loads, drag loads, and overturning moments. The shaft should be adequately reinforced full depth to develop the full tension resistance.

Shaft top spacing is normally set to allow for typical construction tolerances in placement and vertical alignment. Drilled shafts should have a minimum (center-to-center) spacing of three diameters. For large shaft groups, the final design should be checked to evaluate potential for group settlement.

Lateral Capacity

The response of deep foundations to lateral loads is not only dependent upon the soil material's horizontal subgrade reaction, but also on the shaft actual cross-sectional features, effective length, stiffness, arrangement in the shaft cap with respect to direction of loading, and "fix-head" or "free-head" cap interaction conditions. The analysis is usually performed to provide a lateral load that result in some limiting amount of deflection or to a specified maximum yield moment capacity of the shaft. Shafts subjected to lateral and moment loading should be analyzed as part of the structural detailing. Tensile and lateral load resistance of deep foundation elements should be neglected unless the shafts are adequately reinforced.

We have not performed a lateral resistance analyses as part of this scope. However, we have included soil parameters below for a lateral analysis using LPILE™ software. If lateral loads exceed approximately 10 kips/shaft, a detailed analysis of lateral load resistance should be performed after the actual loading conditions and shaft

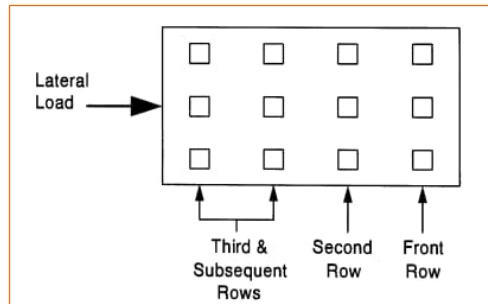
configurations have been determined considering reductions for shadowing in a shaft group.

The following table lists input values for use in LPILE™ analyses. LPILE™ estimates values of k_h and E_{50} based on undrained strength; however, non-default values of k_h should be used where provided. Since deflection or a service limit criterion will likely control lateral capacity design, no safety/resistance factor is included with the parameters.

Approximate Depth Below the Existing Grade (ft) ¹	LPILE™ Soil p-y Model	Effective Unit Weight (lb/ ft ³)	Cohesion (lb/ ft ²)	Internal Angle of Friction (Degrees)	Strain ² E_{50}	Static Lateral Subgrade Modulus ² k (lb/ in ³)	
						Static	Cyclic
Fat Clay ² 0 – 4	Soft Clay	53	250	--	Use Default Values		
Lean Clay 4 – 20	Soft Clay	53	250	--	Use Default Values		
Fat Clay 20 – 35	Soft Clay	53	400	--	Use Default Values		
Fat Clay 35 – 50	Stiff Clay w/o free water	53	500	--	Use Default Values		

1. Minimum foundation depth of 20-ft. If the foundation length is less than 20 feet, analysis for fixity is warranted.
2. The upper 4-feet should not be considered to provide full passive resistance due to potential for disturbance and desiccation effects.

When shafts are used in groups, the lateral capacities of the shafts in the second, third, and subsequent rows of the group should be reduced as compared to the capacity of a single, independent shaft. Guidance for applying p-multiplier factors to the p values in the p-y curves for each row of shaft foundations within a shaft group are as follows:



- Front row: $P_m = 0.8$;
- Second row: $P_m = 0.4$
- Third and subsequent row: $P_m = 0.3$.

For the case of a single row of shafts supporting a laterally loaded grade beam, group action for lateral resistance of shafts would need to be considered when spacing is less than three shaft diameters (measured center-to-center). However, spacing closer than 3D (where D is the diameter of the shaft) is not recommended, due to potential for the installation of a new shaft disturbing an adjacent installed shaft, likely resulting in axial capacity reduction.

Tensile and lateral load resistance of deep foundation elements should be neglected unless the shafts are adequately reinforced. The installation of a long reinforcing cages can be problematic with small diameter shafts. Therefore, it may be appropriate in some cases to design the foundations with deeper foundation caps or grade beams or utilize other means of lateral support where high lateral loads occur.

Load Testing

If a factor of safety of 2 is used to establish the allowable shaft resistance, a static load test should be performed to validate the predicted axial resistance. The cost of the load test should be considered in the selection of the factor of safety/resistance factor for shaft design.

If a load test is planned, at least one shaft representing the predominant diameter and depth should be tested. However, if more than one depth will be used, additional load tests should be added. Alternatively, the shaft can be instrumented with strain gages to provide load distribution information during the testing of a single shaft to allow for estimating allowable loads for shorter shafts. The test shaft(s) should be installed using the installation methods planned for production foundation elements.

For a static load test, the shafts should be loaded to a minimum of 250% of its design capacity after confirming the concrete strength, but typically not sooner than 14 days

after installation. Ideally the shafts should be loaded to produce top of shaft movement as provided below to allow for an accurate interpretation of the ultimate resistance.

Shaft Diameter (inches)	Minimum Top of Shaft Movement For Load Test Interpretation (inches)
24	1 - 1/2
30	1 - 3/4
36	2

The load test including design of the reaction beam and shafts should be provided by the foundation contractor. However, we should oversee the load testing program and validate our capacity predictions based upon the test results.

Shaft Settlement, Drag Load and Down Drag

Shafts installed into the clays below approximately 20 feet from existing grade at the site should experience minimal settlements. Top of shaft movement of less than 1 inch is expected for the allowable design loads. These movements are associated with the loading from the structure and would be in addition to any fill-induced or down-drag settlement, where applicable. The final foundation design for large shaft groups should be evaluated for group effect settlement.

If more than two feet of fill will be placed at this site to achieve final grade, fill induced settlement will create drag load on the shafts which may result in excessive shaft movement from down-drag effects. Drilled shafts typically have sufficient structural capacity to account for drag loads that may develop. Our office should be notified if fill heights exceeding two feet are planned so that we can evaluate the expected top of shaft movement and other potential settlement related development issues.

Drilled Shaft Construction Considerations

The drilling contractor should be experienced in the subsurface conditions observed at the boring locations, and the shaft excavations should be performed with equipment capable of efficiently advancing through the soil and providing a clean bearing area. The straight-shaft foundations should be installed in general accordance with the procedures presented in "Drilled Shafts: Construction Procedure and Design Methods," Publication No. FHWA-NHI-18-024, FHWA GEC 010, September 2018 by the U.S. Department of Transportation Federal Highway Administration, and "Standard Specification for the Construction of Drilled Piers," ACI Publication No. 336.1-01, 2011.

Because the subsurface conditions could vary away from the boring locations, we recommend that the Geotechnical Engineer or his representative observe the shaft installations to evaluate that the intended bearing material is encountered and sufficiently penetrated, and to provide recommendations should conditions vary from those encountered at our borings.

The subsurface conditions predominantly consist of soft to medium stiff, lean to fat clays, occasionally stiff. The clay soils should be relatively easy to drill through using conventional auger drilling equipment. The shaft contractor should have temporary steel casing available to maintain stability of the upper portions of the excavation. More difficult drilling conditions can be expected if sand and silt layers and groundwater are encountered. Prediction of excavation cave-in and the need for casing or mud slurry methods is not exact and depends on many factors including but not limited to: soil strength, sand/silt content, excavation and drilling methods, planned diameter and depth of the excavation, water table at time of construction, amount of time shaft excavation will be open, etc.

The subsurface information suggests that open excavation drilling is unlikely for short term shaft excavations in clay within the upper 50 feet. However, no exact determinations or depth of excavation caving are possible. For example, if a planned shaft is to be advanced and terminated entirely in a clay formation, then casing/mud may not be necessary; however, sand pockets and seams that may have not been detected during drilling may be encountered which may require temporary casing and/or the slurry method to be used. The need for casing/mud slurry is best evaluated at the time of actual construction. The occurrence of sand and silt layering below a depth of 10 and related groundwater may cause difficulties with shaft excavation stability.

The concrete for the drilled shafts should be a flowable mix that can achieve the required compressive strength with a slump of 7 to 9 inches. If open excavation techniques are planned the concrete should be on-site near the end of the shaft excavation process and placed immediately after final excavation of the shaft. Free-fall concrete placement in dry drilled shafts is acceptable, provided care is taken to avoid striking the concrete on the sides of the excavation or the reinforcing steel. A bottom-dump hopper or a tremie, discharging near the bottom of the excavation, could be used to place concrete and reduce concrete segregation. If the mud slurry method is used, the discharge hose end should be placed at the base of the excavation prior to pumping the concrete. A "pig" should be used to reduce the mixing of drill mud and concrete in the discharge hose, and the discharge hose should be continuously raised during the placement with at least five feet of concrete head maintained over the discharge end of the hose. Proper construction techniques and quality control are important for the integrity of the deep foundation system. The drilled shaft installation process should be performed under the observation of the Geotechnical Engineer. The Geotechnical Engineer should document the shaft installation process including soil and groundwater

conditions encountered, consistency with expected conditions, and details of the installed shaft.

The use of temporary steel casing and/or slurry drilling procedures should be anticipated at this site during drilled shaft construction to prevent collapse of the sidewalls within sand seams and layers and control groundwater seepage. If casing is removed during concrete placement, care should be exercised to maintain concrete inside the casing at a sufficient level to resist earth and hydrostatic pressures present on a casing exterior. Water or loose soil should be removed from the bottom of the drilled shafts prior to placement of the concrete.

Driven Timber Pile Foundations

The following paragraphs provide design recommendations and construction considerations for a timber pile supported deep foundation system. Class B timber piles embedded in the clay stratum at about 50 feet below existing grade are recommended for support of moderate structural loads (columns and walls).

Axial Resistance

We have predicted the ultimate compression geotechnical resistance for various sizes and lengths of timber piles using contributions from skin friction and end bearing. The ultimate side friction resistance of the timber piles was predicted using published design approaches for calculation of skin friction including the alpha (α) method for cohesive soils and the β -method for cohesionless soils, including taper effects. The skin friction resistance from the upper 4 feet of the pile was neglected. The ultimate end bearing resistance for the timber piles was estimated using classic bearing capacity theory for cohesive soils and empirical correlations between corrected Standard Penetration Test (SPT) N_{60} values and the mobilized base resistance for cohesionless soils.

The following table provides the nominal (ultimate) pile capacity for minimum 12-inch butt, 7-inch tip ASTM D25 Class B timber piles.

ASTM D25 Class B Timber Pile (Minimum 12-inch butt ¹, 7-inch tip)

Pile Tip Depth ² (feet)	Nominal (Ultimate) Compressive Resistance (tons)	Nominal (Ultimate) Uplift Resistance (tons)
40	18	14
50	25	20
55	30	25

1. Measured 3 feet from the butt end.
2. Referenced from existing grade.

The pile resistance presented in the tables above are the nominal (ultimate) geotechnical resistances and appropriate ASD factors of safety for the design should be established considering control methods specified to verify field capacity at the time of construction. Design capacities can be increased by 33% for highly transient loads such as wind loads, unless these transient loads have been included in the factored design load (subject to verification of allowable structural capacity). The project structural engineer should evaluate the uplift capacity considering connection limitations of timber piles.

Field Capacity Verification Method	Factor of Safety
Installation of 1 probe piles at each proposed building area. Static load test on minimum 1 test pile based on the probe pile with the lowest driving resistance in the last 3 feet of driving. Full-time observation of production pile installation.	2
No static load test, but full-time observation of production pile installation.	3

Pile top spacing is normally set to allow for typical construction tolerances in placement and vertical alignment. General practice is to have the minimum center-to-center pile top spacing at three pile diameters. Greater spacing than the minimum value may be required due to construction limitations, satisfy group effects, and to assure that the piles do not interfere with or intersect each other during installation.

Lateral Capacity

We have not performed a detailed lateral capacity analyses. Timber piles are not considered particularly well suited for lateral and uplift resistance applications. If lateral loads exceed about 2 tons/pile, a detailed analysis of lateral load capacity should be performed after the actual loading conditions have been determined and after the foundation type has been selected.

Load Testing

To utilize a safety factor of 2, a load test should be performed to validate the allowable capacity. The cost of the load test should be considered in the selection of the factor of safety for pile design.

We recommend installing a minimum of 1 probe pile at each building location and then performing a static load test on the pile that exhibits the lowest total blow counts during the last 3 feet of driving. The load test should be performed using ASTM D1143 – Quick Method, with the pile loaded to minimum 250% of its design capacity. The load test reaction frame should be set-up by the pile contractor and Terracon should perform the load test after minimum 14 days of set-up time. If more than one pile depth or pile size is used, an additional pile load test should be performed. The cost/benefit of the load test program should be considered in the overall evaluation of the foundation design.

Pile Settlement, Drag Load and Down Drag

Piles installed into the clays below approximately 40 feet from existing grade at the site should experience minimal settlements. Top of pile movements of less than 1 inch are expected for the allowable design loads. These movements are associated with the loading from the structure and would be in addition to any fill-induced or down-drag settlement, where applicable. The final foundation design for large pile groups (e.g. greater than a 3x3) should be evaluated for group effect settlement.

If more than two feet of fill will be placed at this site to achieve final grade, fill induced settlement may result in excessive pile movement from down-drag effects. Timber piles typically have limited structural capacity so the design should be checked to account for additional drag load. Our office should be notified if fill heights exceeding two feet are planned so that we can evaluate the expected pile movement and other potential settlement related development issues.

Driven Timber Pile Construction Considerations

The contractor should select a driving hammer which can install the selected piling without overstressing the pile material. The timber piles should be installed using a conventional air driven or drop weight pile hammer with a maximum energy rating of 15,000 ft-lb for Class B piles. Pile driving should not be difficult within alluvial material and driving resistance is expected to gradually increase with depth. A probe pile program at the commencement of construction is recommended to confirm driving conditions across the building pad prior to setting pile order lengths. The contractor should submit the pile driving plan and the pile hammer data to the engineer for evaluation of the driving stresses in advance of pile installation.

The piles should be closely observed and if “refusal” or little or no penetration under several successive blows occurs, driving should be ceased. Refusal with the above rated hammers is usually defined as more than 25 bpf for three consecutive feet or 35 bpf for any given foot of driving. While not believed to be likely, predrilling may be needed to achieve sufficient embedment or to bypass the near surface fill material. The need for predrilling could be evaluated during a probe/test pile program. If predrilling is needed, the predrill bit diameter should not be more than $\frac{3}{4}$ of the top diameter of the pile.

The driving criteria should be established at the time of construction based on the characteristics of the pile driving hammer, the load test results, and the required pile capacity. Pile driving conditions, hammer efficiency, stress on the pile during driving and verification of the field pile capacity could be better evaluated during installation using a Pile Driving Analyzer (PDA).

Proper site preparation, construction techniques, and quality control are important for the integrity of the deep foundation system. These construction efforts should be monitored and documented by the geotechnical engineer’s representative. Each pile should be observed and checked for obvious damage, and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

Vibration Monitoring

Vibration monitoring is recommended during installation of driven piles if structures are located within about 200 feet of the pile installation. Thresholds of vibration-induced cracking are generally site specific and depend on the type and age of the structure, the frequency of ground vibration, and the type of soil supporting the structure. Research by the U.S. Bureau of Mines (USBM) and other investigative groups have established criteria relating the occurrence of structural damage to certain frequencies and level of ground motion. Per the USBM, within the range of 4 to 12 hertz, the maximum particle velocity recommended to preclude the threshold damage to plaster-on-wood for old structures is 0.5 inch per second (ips).

It is noted that a threshold of 0.25 ips has been adopted by the US Army Corps of Engineers New Orleans District, is recognized by the local engineering community, and is recommended for the project. Furthermore, a site-specific survey to document conditions at surrounding buildings and to collect vibration data during driving of the production piles is recommended. The existing facility (structures and subsurface utilities) should be observed prior to pile installation to document their condition. Structures should also be observed during pile installation for indications of movement or damage. Monitoring vibration levels during pile driving should be considered. Although vibrations from pile driving may be below levels that will cause structural damage, they may be felt by occupants of the adjacent buildings. The potential impact of driving piles at this site should be considered when evaluating this alternative.

Floor Slabs

Design parameters for floor slabs assume the requirements for [Earthwork](#) have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Depending upon the finished floor elevation, unsuitable, weak, and/or soft to medium stiff soils may be observed at the floor slab subgrade level. These soils should be replaced with structural fill so the floor slab is supported on at least 2 feet of compacted suitable natural soils or structural fill.

Floor Slab Design Parameters

Item	Description
Floor Slab Support¹	Use 4 inches base course meeting material specifications of ACI 302
	Overlying 2 feet of low-plasticity cohesive or granular materials
	Subgrade compacted to recommendations in Earthwork
Estimated Modulus of Subgrade Reaction²	100 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in [Earthwork](#), and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible

compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Mitigation measures, as noted in **Existing Fill** within **Earthwork**, are critical to the performance of floor slabs. In addition to the mitigation measures, the floor slab can be stiffened by adding steel reinforcement, grade beams, and/or post-tensioned elements.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. The listed pavement component thicknesses should be used as a guide for pavement systems at the site. These recommendations assume a 20-year pavement design life. If pavement frequencies or loads will be different than those specified, Terracon should be contacted and allowed to review these recommendations.

Construction traffic on the pavements was not considered in developing the recommended minimum pavement thicknesses. If the pavements will be subject to

traffic by construction equipment/vehicles, the pavement thicknesses should be revised to consider the effects of the additional traffic loading. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the [Earthwork](#) section.

Pavement Design Parameters

An estimated California Bearing Ratio (CBR) of 3 was used for the subgrade for the asphaltic concrete (AC) pavement designs. A modulus of subgrade reaction of 100 pci was used for the portland cement concrete (PCC) pavement designs. The value was empirically derived based upon our experience with the clay subgrade soils and our expectation of the quality of the subgrade as prescribed by the **Site Preparation** conditions as outlined in [Earthwork](#). A modulus of rupture of 550 psi was used in design for the concrete (based on correlations with a minimum 28-day compressive strength of 4,000 psi).

Pavement Section Thicknesses

The following table provides our opinion of minimum thickness for AC sections:

Asphaltic Concrete Design

Layer	Thickness (inches)				
	Parking Stalls ¹		Driveways ¹		Entrances/ Exits ¹
AC ^{2, 3}	3	3	4	4	Concrete Only
Aggregate Base ²	6	--	6	--	
Soil Cement Base ²	--	9	--	9	

1. See [Project Description](#) for more specifics regarding traffic assumptions.
2. All materials and construction should meet the current Louisiana Department of Transportation Specifications for Roads and Bridges (LSSRB)
 - Asphaltic Surface and Base – LSSRB 2016: Section 500 and 1002
 - Aggregate base – LSSRB 2016 No. 610 limestone or similarly graded recycled crushed concrete: Section 1033.03
 - Soil-cement base – LSSRB: Section 305. The lime and/or cement addition rates should be based upon classification testing performed on the actual proposed soils at the time of construction in accordance with Section 305.04. Based on soil conditions observed in the upper 2 feet at the soil boring locations the cement addition rate should be 9% Type I Cement by volume. Initial lime treatment with 9% hydrated lime by volume may be necessary depending on

Asphaltic Concrete Design

Layer	Thickness (inches)		
	Parking Stalls ¹	Driveways ¹	Entrances/ Exits ¹

soils present at the finished subgrade at the time of construction to reduce PI to less than 15 prior to cement treatment.

3. A minimum 1.5-inch surface course should be used on ACC pavements.
4. A minimum 7-inch concrete pavement is recommended at entrances to provide increased resistance to turning forces and rutting. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.

The following table provides our estimated minimum thickness of PCC pavements.

Portland Cement Concrete Design

Layer	Thickness (inches)			
	Parking Stalls ¹	Driveways ¹	Entrances/ Exits ¹	Dumpster Pad/ Bus Lanes ¹
PCC ²	5	6	7	8
Aggregate Base ²	4	4	4	4

1. See [Project Description](#) for more specifics regarding traffic classifications.
2. All materials should meet the current Louisiana Department of Transportation Specifications for Roads and Bridges (LSSRB).
 - Concrete Pavement - LSSRB 2016: Section 601
 - Aggregate base - LSSRB 2016 No. 610 limestone or similarly graded recycled crushed concrete: Section 1033.03

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

Although not required for structural support, a minimum 4-inch thick dense graded base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC

pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its “green” state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the stormwater collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section.

Based on the possibility of shallow and/or perched groundwater, we recommend installing a pavement subdrain system to control groundwater, improve stability, and improve long-term pavement performance.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Place 8 inches of compacted dense graded crushed stone around drop inlet basins extending at least 8 inches from the perimeter to reduce settlement at pavement interface
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-

party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

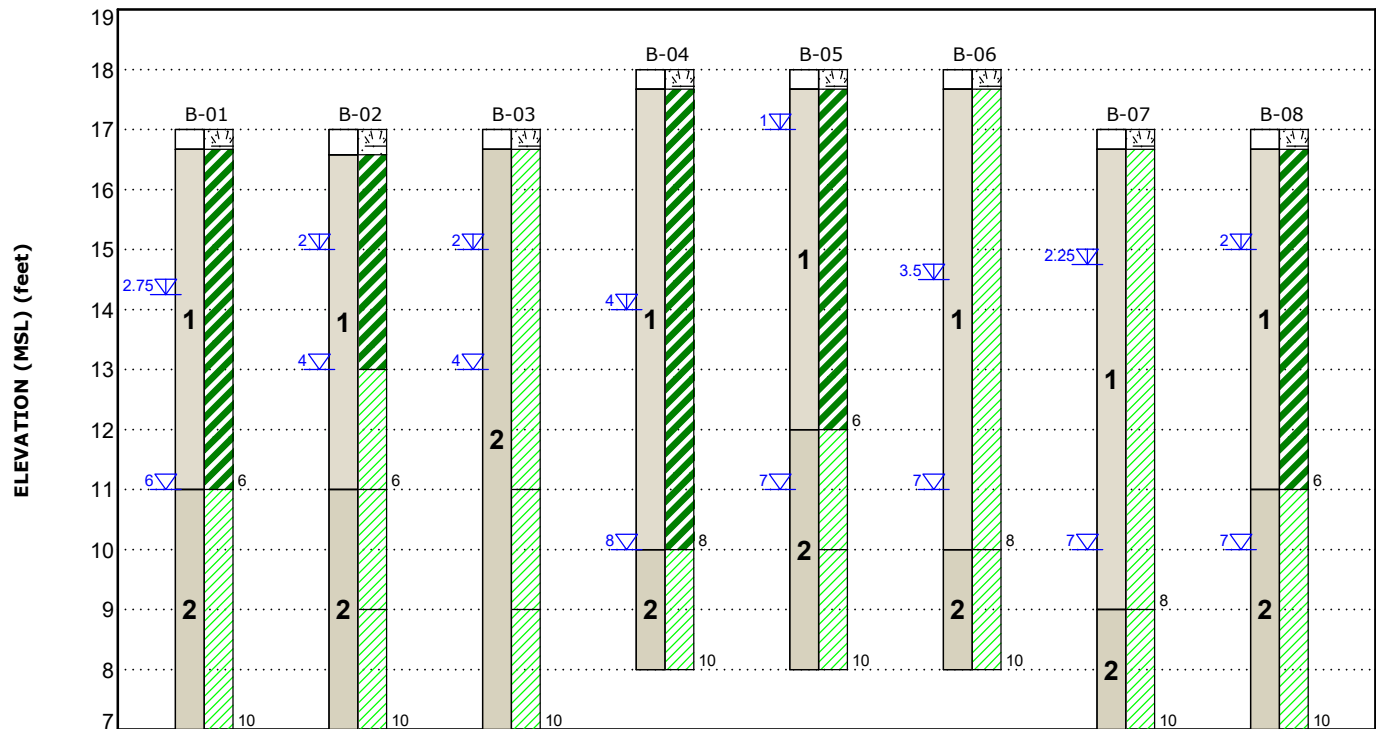
Figures

Contents:

GeoModel (3 pages)

Note: All attachments are one page unless noted above.

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

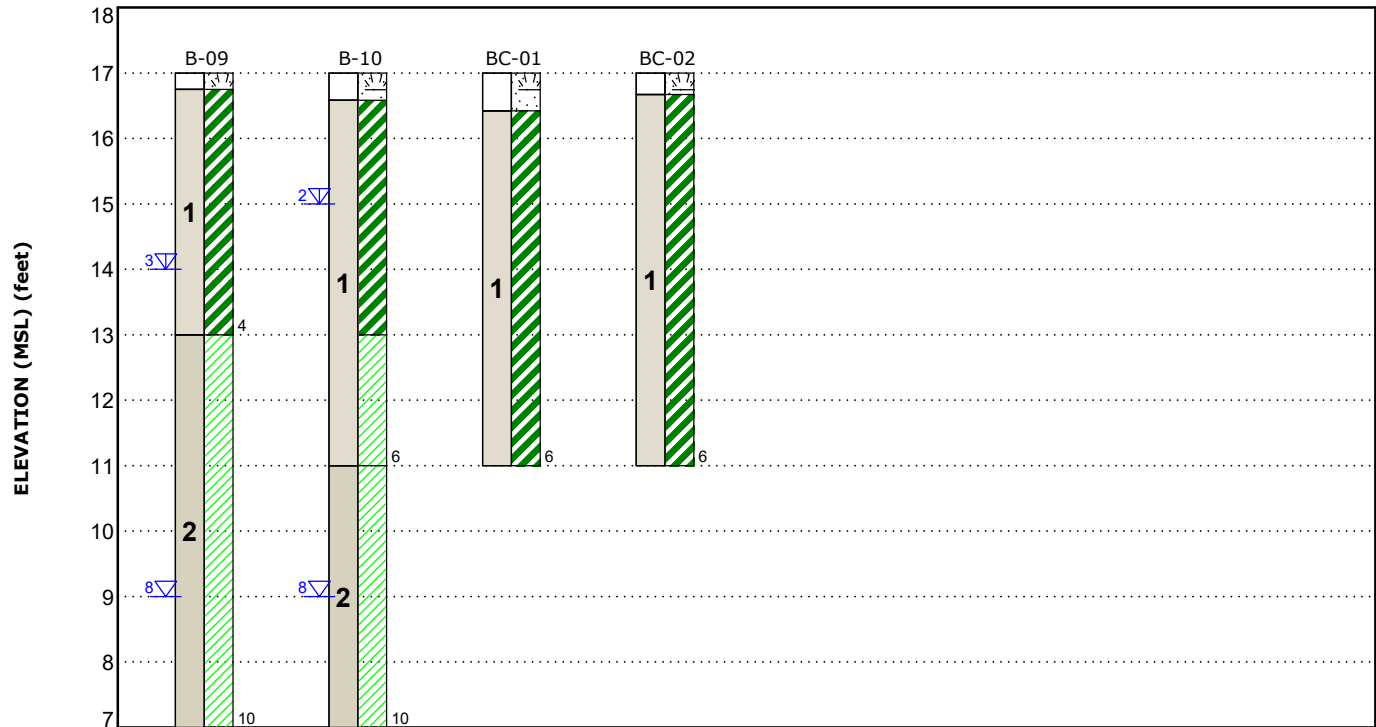
Model Layer	Layer Name	General Description	Legend	
1	Near Surface Stiff Clays	Brown and gray, stiff to very stiff, occasionally medium stiff to stiff fat to lean clay with gravel, sand, and ferrous nodules	Topsoil	Fat Clay
2	Near Surface Soft Clays	Brown and gray, soft to medium stiff, lean clay with occasional silt and sand pockets	Lean Clay	
3	Deeper Clays	Brown to gray, (very) soft to medium stiff lean clay (Layers in CPTs based on soil behavior type)		
4	Clays with Sand Seams	Medium stiff to stiff lean/fat clays with silt and sand seams (Layers in CPTs based on soil behavior type)		

▽ First Water Observation
▽ Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

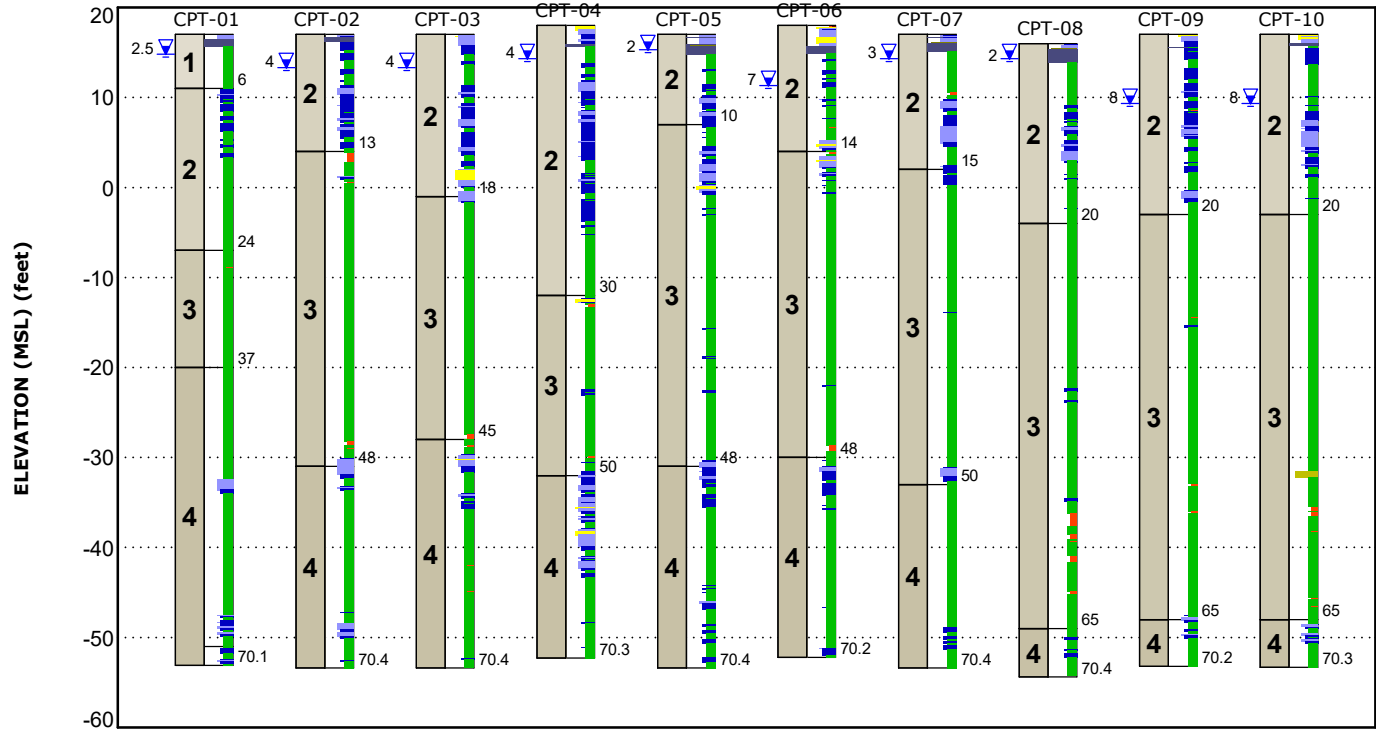
Model Layer	Layer Name	General Description	Legend	
1	Near Surface Stiff Clays	Brown and gray, stiff to very stiff, occasionally medium stiff to stiff fat to lean clay with gravel, sand, and ferrous nodules	Topsoil	Fat Clay
2	Near Surface Soft Clays	Brown and gray, soft to medium stiff, lean clay with occasional silt and sand pockets	Lean Clay	
3	Deeper Clays	Brown to gray, (very) soft to medium stiff lean clay (Layers in CPTs based on soil behavior type)		
4	Clays with Sand Seams	Medium stiff to stiff lean/fat clays with silt and sand seams (Layers in CPTs based on soil behavior type)		

- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description	Legend
1	Near Surface High Plasticity	Brown and gray, stiff to very stiff, occasionally medium stiff to stiff fat clay with gravel, sand, and ferrous nodules	
2	Near Surface Low Plasticity	Brown and gray, soft to medium stiff, lean clay with occasional silt and sand pockets	
3	Deeper Clays	Brown to gray, (very) soft to medium stiff lean clay (Layers in CPTs based on soil behavior type)	
4	Clays with Sand Seams	Medium stiff to stiff lean/fat clays with silt and sand seams (Layers in CPTs based on soil behavior type)	

Soil Behavior Type (SBT)

7 Gravelly sand to dense sand	8 Very stiff sand to clayey sand	3 Clay - silty clay to clay
1 Sensitive, fine grained	2 Organic soils - clay	6 Sands - clean sand to silty sand
4 Silt mixtures - clayey silt to silty clay	5 Sand mixtures - silty sand to sandy silt	9 Very stiff fine grained

▽ CPT Assumed Water Depth

▽ First Water Observation

▽ Second Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

Geotechnical Engineering Report

Cohn Elementary | Port Allen, Louisiana

April 16, 2025 | Terracon Project No. EH255033



Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Type of Exploration	Boring Depth (feet)	Planned Location
4	Soil Boring	10	Phase 1 Building Area
4	CPT Sounding	70	Phase 1 Building Area
2	Soil Boring	10	Phase 2 Building Area
2	CPT Sounding	70	Phase 2 Building Area
4	Soil Boring	10	Phase 3 Building Area
4	CPT Sounding	70	Phase 3 Building Area
2	Soil Boring	6	Basketball Court Area (Phase 4)

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ± 10 feet) and referencing existing site features. Approximate ground surface elevations were estimated using Google Earth imagery. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with an ATV-mounted rotary drill rig using continuous flight augers (solid stem) to a depth of around 10 feet. Five samples were obtained in the upper 10 feet of each boring. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings or cement-bentonite grout after their completion, consistent with state regulations.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

At each designated location, a CPT sounding was performed by pushing a 10 or 15-square centimeter electric cone penetrometer at an approximate rate of 20 millimeters/second using the hydraulic cylinders of the drilling rig. The cone penetrometer is equipped with electronic load cells to measure tip resistance and sleeve resistance, and a pressure transducer to measure the generated ambient pore pressure.

Digital data representing the tip resistance, the sleeve penetration, the pore pressure and the CPT sounding inclination are typically measured at 50 mm intervals during penetration using a CPT data acquisition system or logger. These data were transferred to an on-site computer using a cable transmission system. This process allowed continuous monitoring of the data as the cone was advanced in real-time.

Upon completing the test, the data collected was downloaded directly from the CPT data logger to an on-site computer. The collected data was then interpreted using a software package provided by the cone manufacturer to provide the cone and sleeve resistance, pore pressure and inclination. The software also provides interpretation of soil behavior types (clay, silt, sand, etc.) and selected soil parameters, such as undrained shear strength, overconsolidation ratio, and equivalent standard penetration resistance. The testing and calibration of the CPT device was conducted in general conformance with ASTM D5778.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Atterberg Limits
- Dry Unit Weight
- Unconfined Compression

The laboratory testing program included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

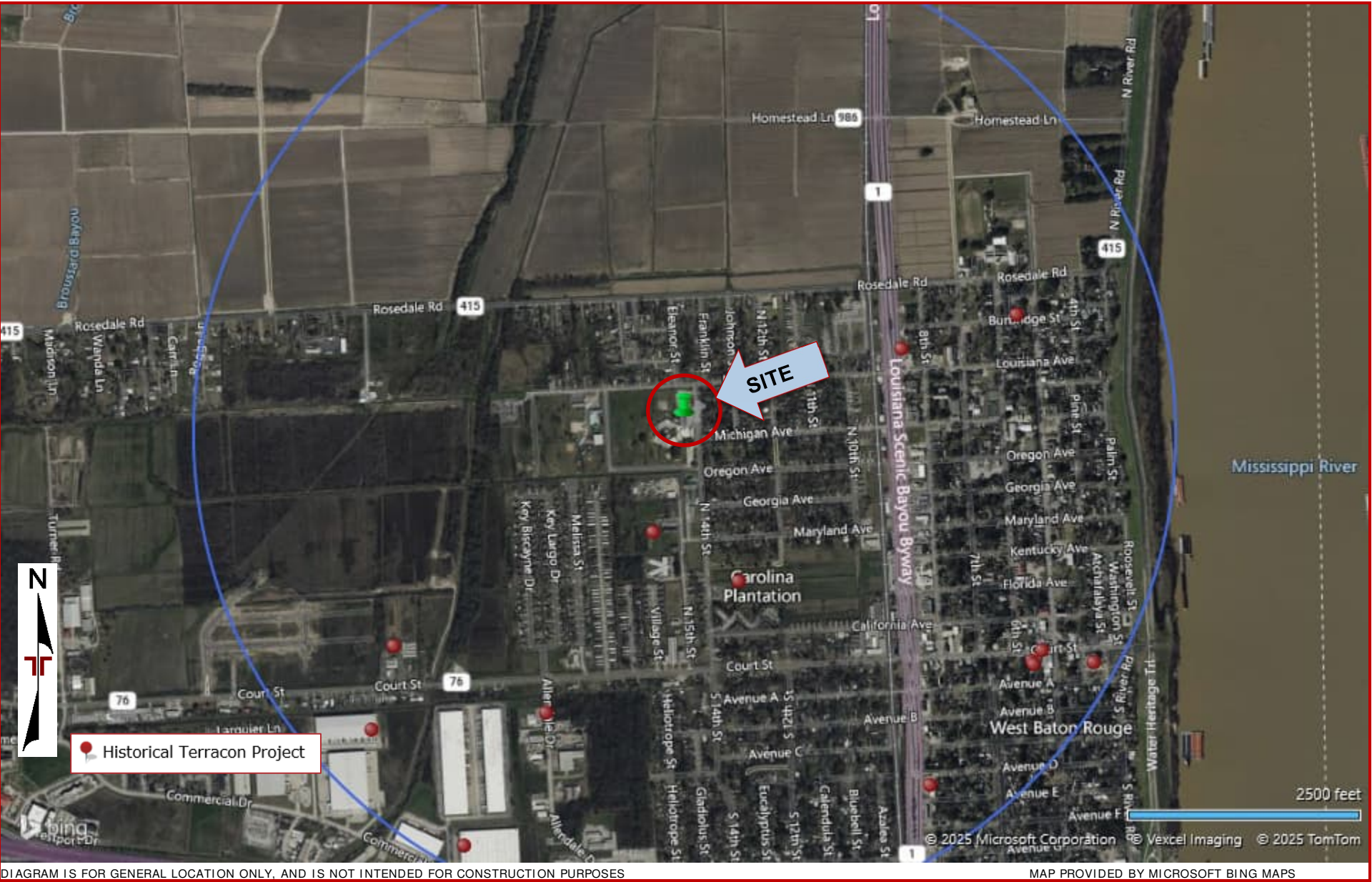
Contents:

Site Location Plan

Exploration Plan

Note: All attachments are one page unless noted above.

Site Location



Exploration Plan



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (12 pages)

CPT Boring Logs (10 pages)

Note: All attachments are one page unless noted above.

Boring Log No. B-01

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4596° Longitude: -91.2192°	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits
							Test Type	Compressive Strength (tsf)	Strain (%)			LL-PL-PI
		Depth (Ft.) Approximate Elevation: 17 (Ft.)										
1		0.3 4 inches of TOPSOIL 16.67				3.00 (HP)				31.1		70-29-41
		FAT CLAY (CH), brown and gray, medium stiff				3.00 (HP)	UC	0.95	12.5	34.0	86	53-23-30
				▽		3.00 (HP)						
						3.00 (HP)				31.5		
2		6.0 11 LEAN CLAY (CL), brown and gray, soft		▽		2.50 (HP)	UC	0.32	15	26.6	102	
		10.0 7 2.00 (HP)										
		Boring Terminated at 10 Feet	10									

Notes	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).	Water Level Observations ▽ While drilling ▽ At 15 min	Drill Rig GP#1245 Driller D. Gannfors Logged by A. Grant Boring Started 03-24-2025 Boring Completed 03-24-2025
	See Supporting Information for explanation of symbols and abbreviations.		
	Elevation Reference: Elevations were estimated using Google Earth imagery.	Advancement Method 0' - 10' Continuous Flight Auger Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite	

Boring Log No. B-02

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4593° Longitude: -91.2191° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
		0.4 5 inches of TOPSOIL 16.58				2.50 (HP)				27.5		57-19-38
1		FAT CLAY (CH) , brown, medium stiff, with ferrous nodules - with organics from 0 to 1 foot		▽		2.00 (HP)	UC	0.54	8.3	30.8	92	
						2.00 (HP)						
		4.0 LEAN CLAY (CL) , brown, stiff, with ferrous nodules 13		▽		2.00 (HP)						36-19-17
						2.00 (HP)				29.8		
2		6.0 LEAN CLAY (CL) , brown, very soft, with ferrous nodules 11				1.50 (HP)	UC	0.07	15	37.8	95	
		8.0 LEAN CLAY (CL) , brown, stiff, with ferrous nodules 9				2.00 (HP)						
		10.0 Boring Terminated at 10 Feet 7	10									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
See [Supporting Information](#) for explanation of symbols and abbreviations.
Elevation Reference: Elevations were estimated using Google Earth imagery.

Notes

Water Level Observations

- ▽ While drilling
- ▽ At 15 min

Drill Rig
GP#1245

Driller
D. Gannfors

Logged by
A. Grant

Boring Started
03-25-2025

Boring Completed
03-25-2025

Advancement Method

0' - 10' Continuous Flight Auger

Abandonment Method

Boring backfilled with Auger Cuttings and/or Bentonite

Boring Log No. B-03

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4594° Longitude: -91.2189° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
2		0.3 4 inches of TOPSOIL 16.67				3.00 (HP)				24.2		42-17-25
		LEAN CLAY (CL) , brown and gray, soft to medium stiff - with organics at 0 to 1 foot		▽		3.50 (HP)	UC	0.82	9	27.9	92	35-18-17
						3.00 (HP)						
				▽		2.00 (HP)				28.5		
		6.0 LEAN CLAY (CL) , gray, very soft 11				1.50 (HP)	UC	0.07	11.4	29.2	97	
		8.0 LEAN CLAY (CL) , gray, stiff 9				2.50 (HP)						
		10.0 Boring Terminated at 10 Feet 7	10									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevation Reference: Elevations were estimated using Google Earth imagery.

Water Level Observations

▽ While drilling

▽ At 15 min

Drill Rig
GP#1245

Driller
D. Gannfors

Logged by
A. Grant

Boring Started
03-25-2025

Boring Completed
03-25-2025

Notes

Advancement Method
0' - 10' Continuous Flight Auger

Abandonment Method
Boring backfilled with Auger Cuttings and/or Bentonite

Boring Log No. B-04

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4594° Longitude: -91.2185° Depth (Ft.) Approximate Elevation: 18 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
1		0.3 4 inches of TOPSOIL 17.67				4.50 (HP)				24.6		71-25-46
		FAT CLAY (CH), brown and gray, stiff to very stiff, with gravel and ferrous nodules				4.00 (HP)	UC	1.93	15	23.5	97	
						3.50 (HP)						
			5	▽		3.00 (HP)				27.9		68-25-43
						2.50 (HP)						
2		8.0 LEAN CLAY (CL), gray and tan, soft to medium stiff 10		▽		2.50 (HP)	UC	0.33	15	27.8	97	
		10.0 Boring Terminated at 10 Feet 8	10									

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
See [Supporting Information](#) for explanation of symbols and abbreviations.
Elevation Reference: Elevations were estimated using Google Earth imagery.

Notes

Water Level Observations

- ▽ While drilling
- ▽ At 15 min

Drill Rig
GP#1245

Driller
D. Gannfors

Logged by
A. Grant

Boring Started
03-25-2025

Boring Completed
03-25-2025

Advancement Method

0' - 10' Continuous Flight Auger

Abandonment Method

Boring backfilled with Auger Cuttings and/or Bentonite

Boring Log No. B-05

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4589° Longitude: -91.2194° Depth (Ft.) Approximate Elevation: 18 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
		0.3 4 inches of TOPSOIL 17.67				4.00 (HP)				30.8		61-22-39
1		FAT CLAY (CH), brown and gray, stiff to very stiff		▽		2.50 (HP)	UC	1.40	13.8	22.7	98	33-19-14
						2.50 (HP)						
						2.50 (HP)				26.8		
2		LEAN CLAY (CL), gray and brown, medium stiff		▽		2.00 (HP)						
						2.00 (HP)	UC	0.64	8.8	25.4	115	
		10.0 8	10									
		Boring Terminated at 10 Feet										

Notes	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).	Water Level Observations ▽ While drilling ▽ At 15 min	Drill Rig GP#1245
	See Supporting Information for explanation of symbols and abbreviations.		
	Elevation Reference: Elevations were estimated using Google Earth imagery.		
	Advancement Method 0' - 10' Continuous Flight Auger	Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite	Driller D. Gannfors
			Logged by A. Grant
			Boring Started 03-24-2025
			Boring Completed 03-24-2025

Boring Log No. B-06

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4588° Longitude: -91.2192° Depth (Ft.) Approximate Elevation: 18 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
1		0.3 4 inches of TOPSOIL 17.67				4.00 (HP)				16.3		49-17-32
		LEAN CLAY (CL), brown, stiff to very stiff - with sand to 4 feet				3.50 (HP)	UC	1.15	8	18.9	107	43-14-29
				▽		2.50 (HP)						
			5			2.50 (HP)				26.3		
				▽		2.00 (HP)						
2		8.0 LEAN CLAY (CL), brown, soft 10				1.50 (HP)	UC	0.28	14.4	28.4	109	
		10.0 Boring Terminated at 10 Feet 8	10									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations. Elevation Reference: Elevations were estimated using Google Earth imagery.	Water Level Observations  While drilling  At 15 min		Drill Rig GP# 1245
			Driller D. Gannfors
			Logged by A. Grant
Notes	Advancement Method 0' - 10' Continuous Flight Auger		Boring Started 03-25-2025
	Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite		Boring Completed 03-25-2025

Boring Log No. B-07

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4584° Longitude: -91.2194° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
1		0.3 4 inches of TOPSOIL 16.67				3.50 (HP)						
		LEAN CLAY (CL), brown and gray, medium stiff to stiff		▽		2.50 (HP)				24.8		37-20-17
						3.00 (HP)	UC	0.85	15	24.9	101	
			5			2.50 (HP)						
				▽		3.00 (HP)				28.2		32-22-10
2		8.0 9 LEAN CLAY (CL), brown and gray, very soft - low strain failure at 8 feet				2.00 (HP)	UC	0.03	1	31.5	100	
		10.0 7 Boring Terminated at 10 Feet	10									

Notes	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations. Elevation Reference: Elevations were estimated using Google Earth imagery.	Water Level Observations ▽ While drilling ▽ At 15 min	Drill Rig GP#1245
		Advancement Method 0' - 10' Continuous Flight Auger	Driller D. Gannfors
		Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite	Logged by A. Grant Boring Started 03-24-2025 Boring Completed 03-24-2025

Boring Log No. B-08

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4581° Longitude: -91.2193°	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits
							Test Type	Compressive Strength (tsf)	Strain (%)			LL-PL-PI
		Depth (Ft.) Approximate Elevation: 17 (Ft.)										
1		0.3 4 inches of TOPSOIL 16.67				3.00 (HP)				33.8		60-27-33
		FAT CLAY (CH), brown and gray, stiff to very stiff		▽		3.00 (HP)	UC	1.52	15	30.9	91	
						3.00 (HP)						
						2.50 (HP)						
2		6.0 11 LEAN CLAY (CL), brown, gray, and tan, soft to medium stiff		▽		2.00 (HP)	UC	0.44	14.6	30.9	95	
		10.0 7				2.50 (HP)				27.7		28-19-9
		Boring Terminated at 10 Feet	10									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were estimated using Google Earth imagery.

Notes

Water Level Observations
▽ While drilling
▽ At 15 min

Drill Rig
GP#1245

Driller
D. Gannfors

Advancement Method
0' - 10' Continuous Flight Auger

Logged by
A. Grant

Abandonment Method
Boring backfilled with Auger Cuttings and/or Bentonite

Boring Started
03-24-2025

Boring Completed
03-24-2025

Boring Log No. B-09

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4584° Longitude: -91.2189° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
1		3 inches of TOPSOIL FAT CLAY (CH), brown and gray, stiff to very stiff	0.3 16.75			3.50 (HP)				38.0		75-23-52
						2.50 (HP)	UC	1.44	15	24.3	96	33-19-14
				▽		2.50 (HP)						
2		LEAN CLAY (CL), gray, soft to medium stiff, with ferrous nodules	4.0 13			2.50 (HP)				28.6		
						2.50 (HP)						
				▽		2.00 (HP)	UC	0.34	14.2	28.5	94	
		Boring Terminated at 10 Feet	10									

Notes	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).	Water Level Observations ▽ While drilling ▽ At 15 min	Drill Rig GP#1245
	See Supporting Information for explanation of symbols and abbreviations.		
	Elevation Reference: Elevations were estimated using Google Earth imagery.		
Notes		Advancement Method 0' - 10' Continuous Flight Auger	Driller D. Gannfors
Notes		Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite	Logged by A. Grant
Notes			Boring Started 03-24-2025
			Boring Completed 03-24-2025

Boring Log No. B-10

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4582° Longitude: -91.2187° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
		0.4 5 inches of TOPSOIL 16.58				3.50 (HP)				28.4		54-22-32
1		FAT CLAY (CH), brown and gray, stiff to very stiff, with gravel				3.00 (HP)	UC	1.63	14.3	31.5	88	44-18-26
						3.00 (HP)						
		4.0 LEAN CLAY (CL), brown, stiff to very stiff 13				3.00 (HP)				27.2		
		6.0 LEAN CLAY (CL), gray, soft 11				2.50 (HP)						
2						2.50 (HP)						
		10.0 Boring Terminated at 10 Feet 7				2.50 (HP)	UC	0.37	15	29.0	97	
			10									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.
Elevation Reference: Elevations were estimated using Google Earth imagery.

Water Level Observations
 While drilling
 At 15 min

Drill Rig
GP#1245

Driller
D. Gannfors

Notes

Advancement Method
0' - 10' Continuous Flight Auger

Logged by
A. Grant

Abandonment Method
Boring backfilled with Auger Cuttings and/or Bentonite

Boring Started
03-24-2025
Boring Completed
03-24-2025

Boring Log No. BC-01

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4583° Longitude: -91.2197° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
		0.6 5 inches of TOPSOIL 16.42				3.00 (HP)				27.8		55-21-34
1		FAT CLAY (CH) , brown and gray, stiff to very stiff - with organics to 2 feet - ferrous nodules below 2 feet	5			2.50 (HP)						
						2.50 (HP)						
						2.00 (HP)						
		6.0 Boring Terminated at 6 Feet 11										

Notes	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).	Water Level Observations No free water observed	Drill Rig GP#1245 Driller D. Gannfors Logged by A. Grant Boring Started 03-24-2025 Boring Completed 03-24-2025
	See Supporting Information for explanation of symbols and abbreviations.		
	Elevation Reference: Elevations were estimated using Google Earth imagery.	Advancement Method 0' - 10' Continuous Flight Auger Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite	

Boring Log No. BC-02

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.4581° Longitude: -91.2198° Depth (Ft.) Approximate Elevation: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test			Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
							Test Type	Compressive Strength (tsf)	Strain (%)			
1		0.3 4 inches of TOPSOIL 16.67 FAT CLAY (CH), brown and gray, very stiff	5			4.00 (HP)				26.2		63-21-42
						4.00 (HP)						
						3.00 (HP)						
						2.50 (HP)						
		Boring Terminated at 6 Feet										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations. Elevation Reference: Elevations were estimated using Google Earth imagery.	Water Level Observations No free water observed	Drill Rig GP# 1245
		Driller D. Gannfors
		Logged by A. Grant
Notes	Advancement Method 0' - 10' Continuous Flight Auger	Boring Started 03-24-2025
	Abandonment Method Boring backfilled with Auger Cuttings and/or Bentonite	Boring Completed 03-24-2025

CPT Sounding ID CPT-01

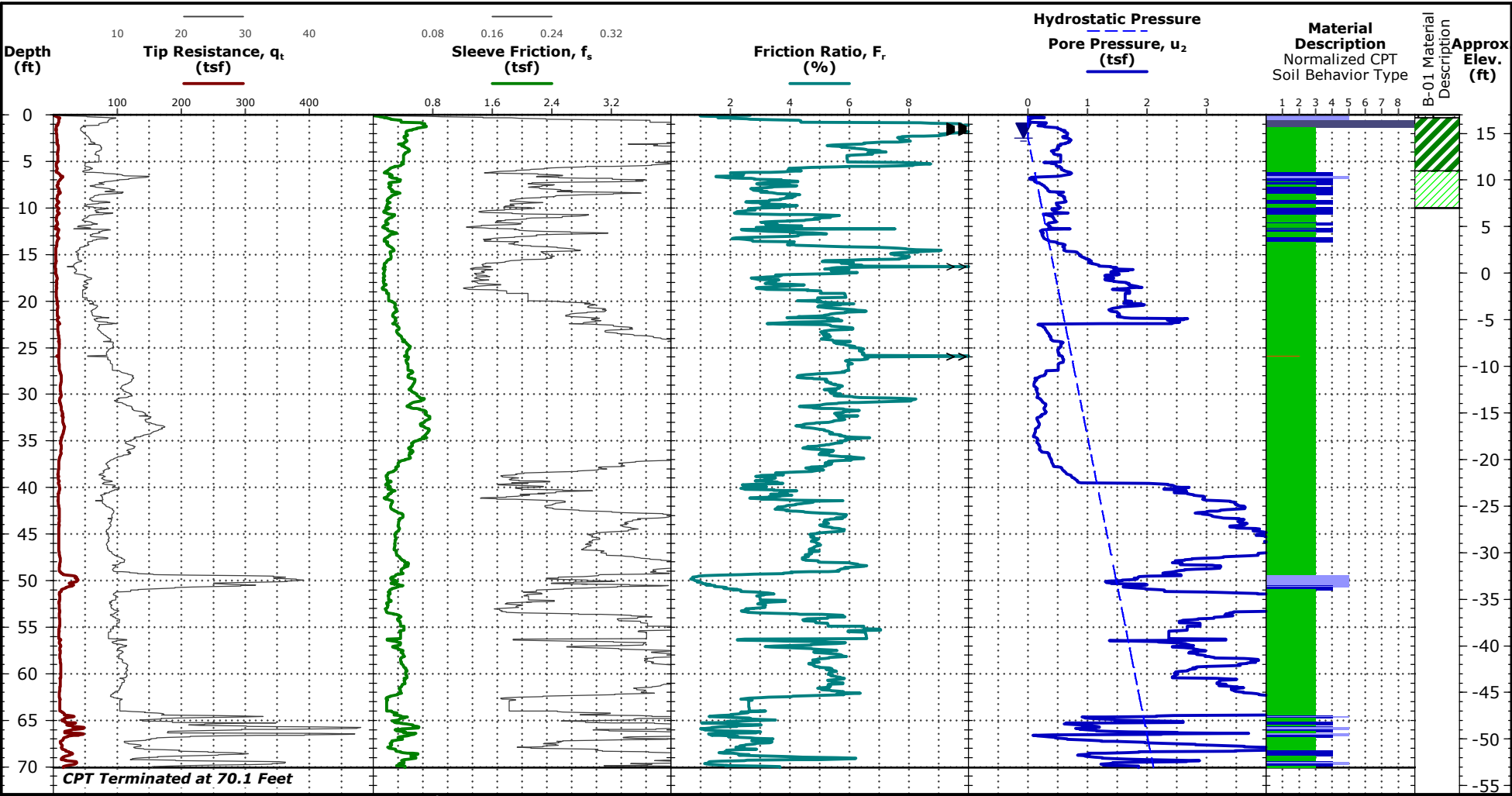


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

CPT Started: 3/26/2025
CPT Completed: 3/26/2025

Elevation: 17 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.

Latitude: 30.4596° Longitude: -91.2192°



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-01 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

▼ 2.5 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-02

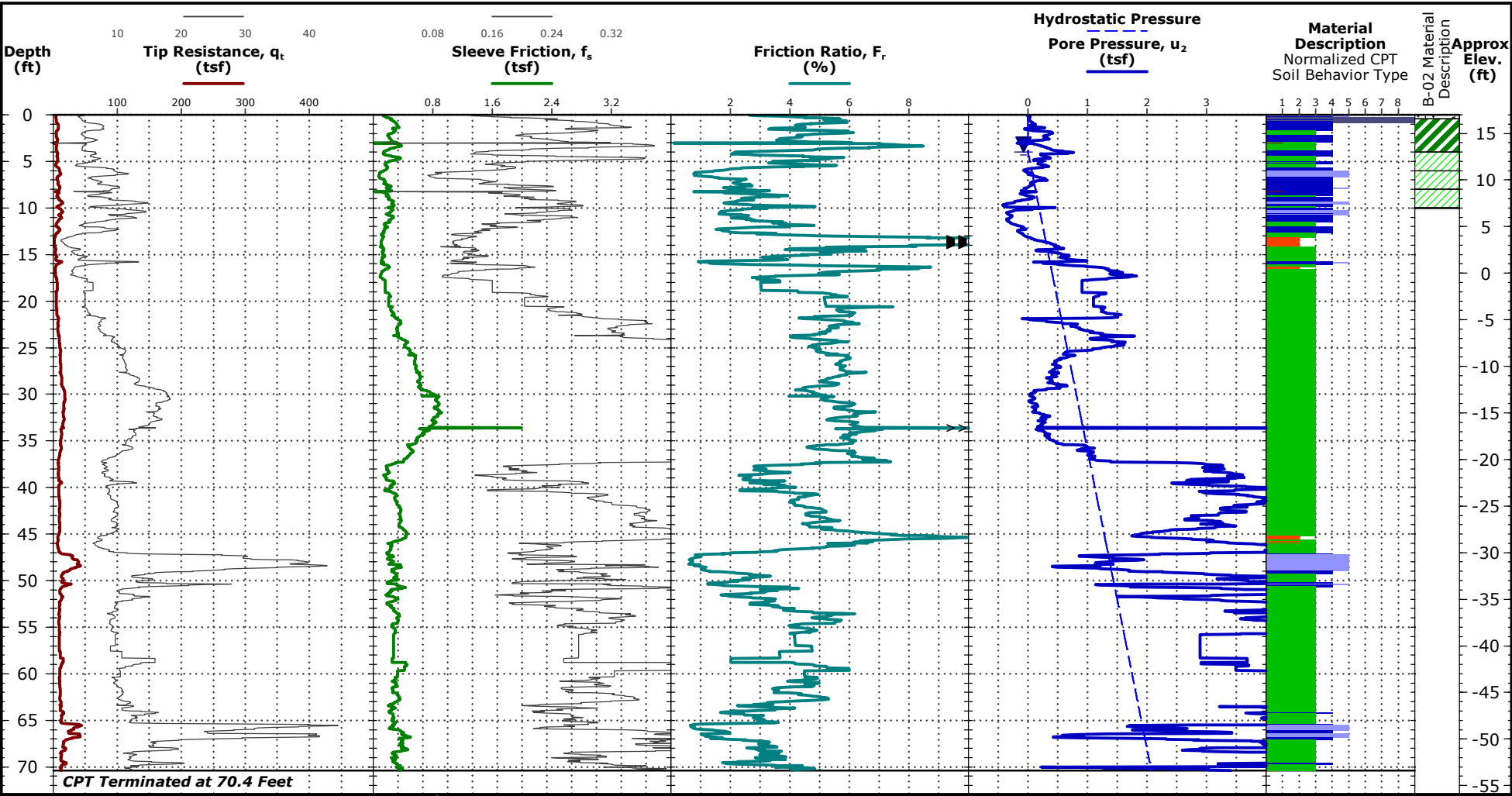


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

CPT Started: 3/25/2025
CPT Completed: 3/25/2025

Elevation: 17 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.

Latitude: 30.4593° Longitude: -91.2191°



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-02 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

4 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-03

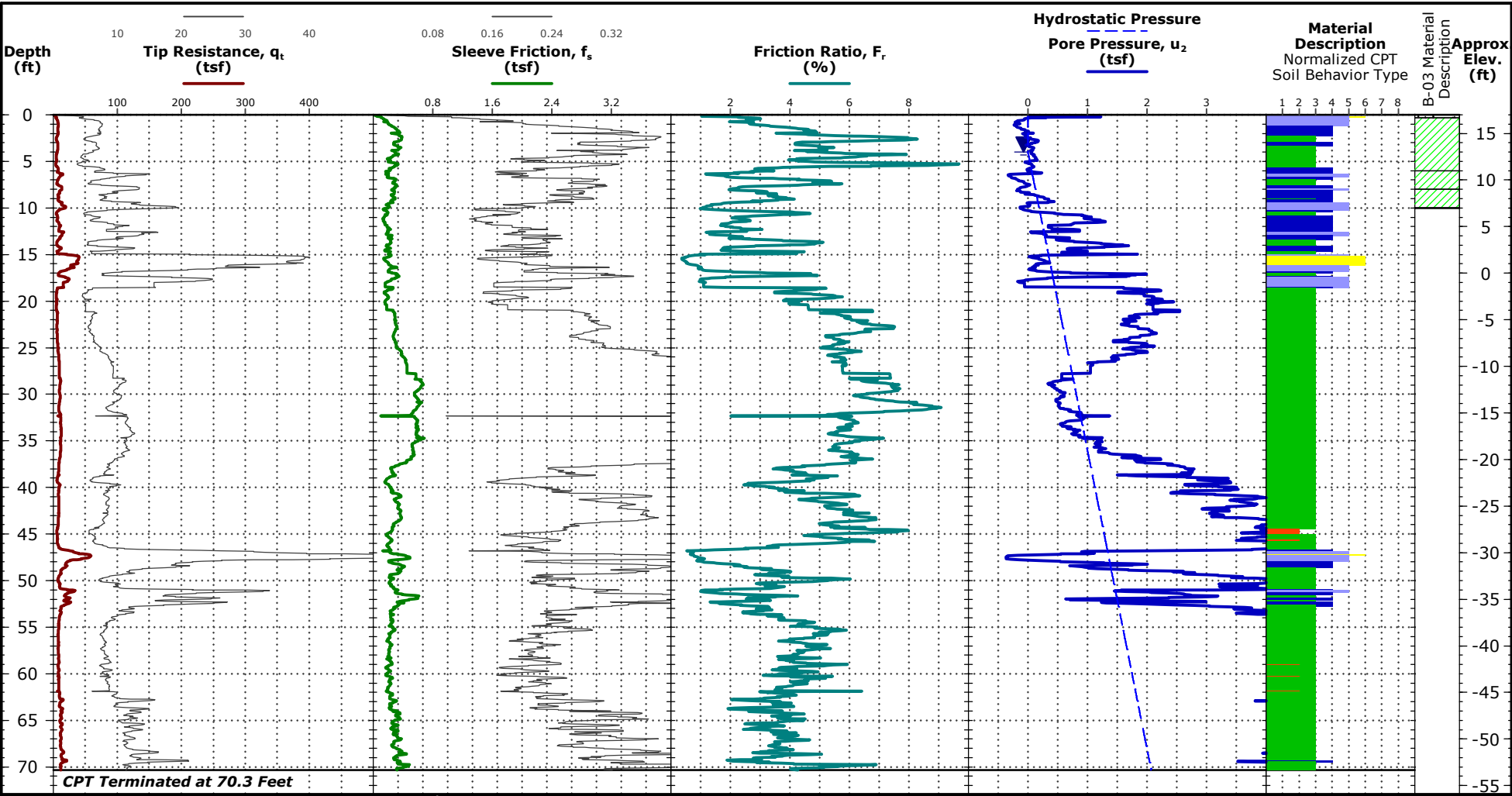
Latitude: 30.4594° Longitude: -91.2189°



2822 O'Neal Ln, Bldg B
Baton Rouge, LA

CPT Started: 3/25/2025
CPT Completed: 3/25/2025

Elevation: 17 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-03 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

4 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-04

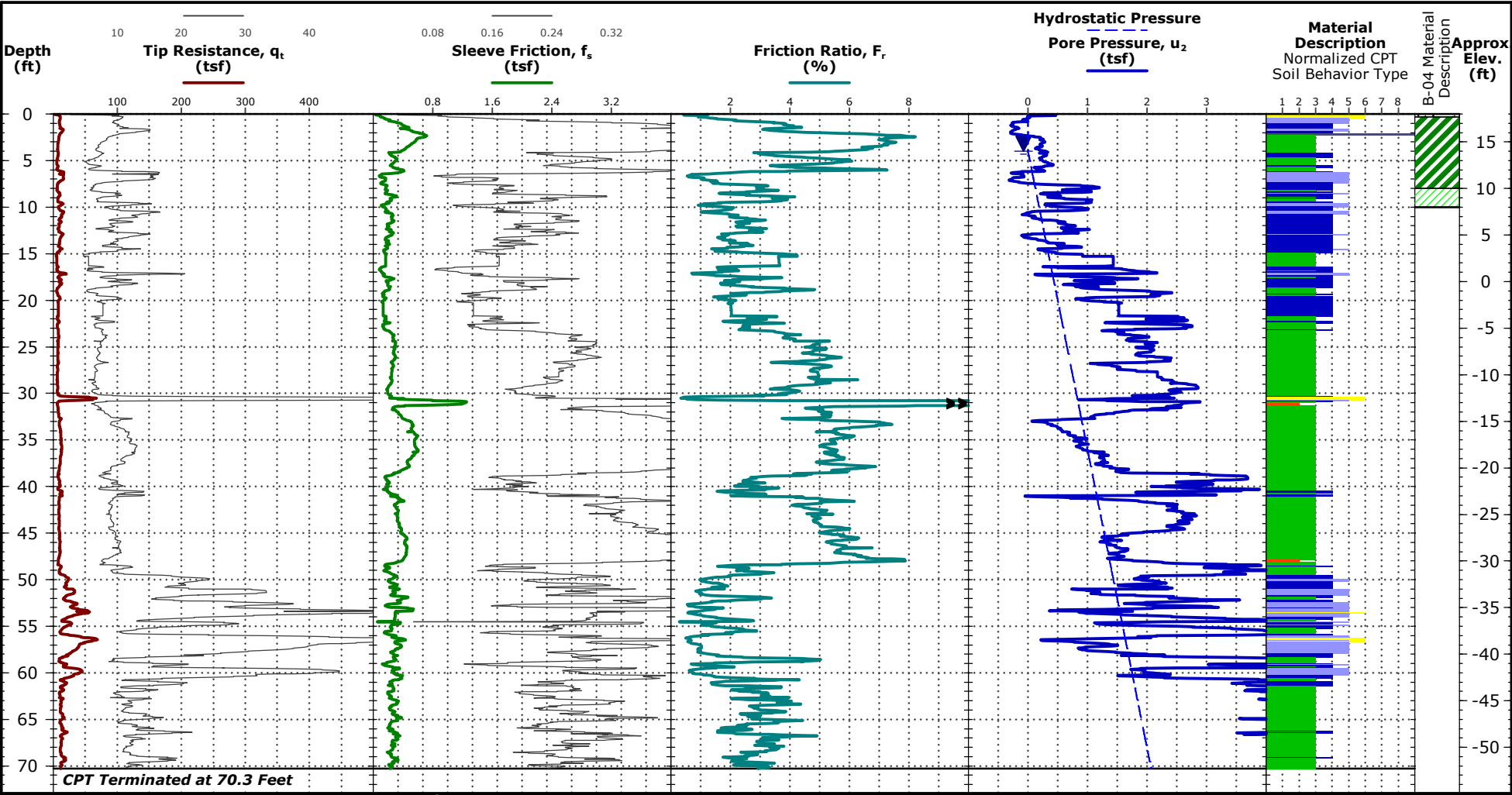


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

Elevation: 18 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.

Latitude: 30.4595° Longitude: -91.2185°

CPT Started: 3/25/2025
CPT Completed: 3/25/2025



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-04 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

4 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-05

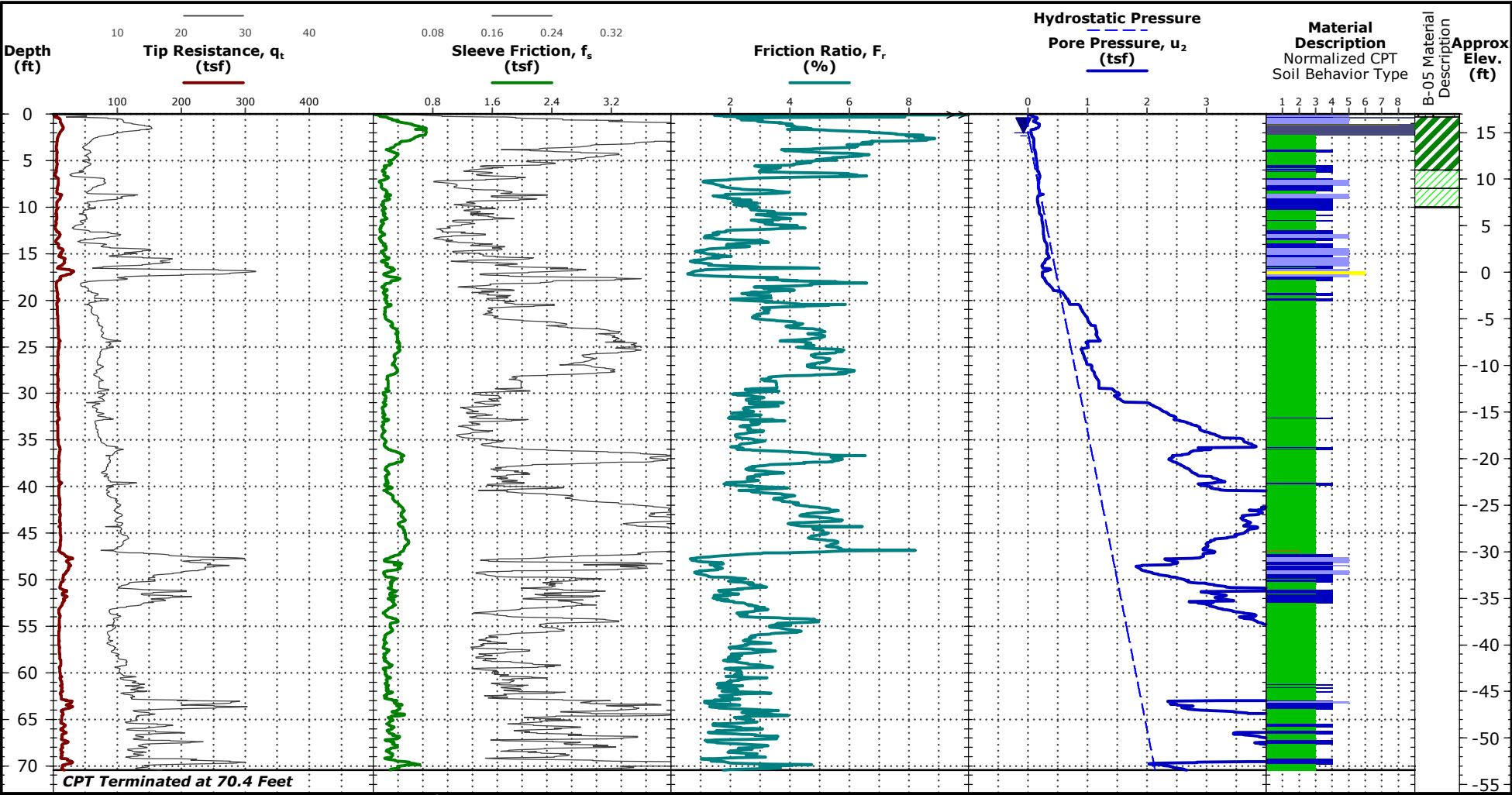


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

Elevation: 17 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.

Latitude: 30.4590° Longitude: -91.2194°

CPT Started: 3/26/2025
CPT Completed: 3/26/2025



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-05 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

▼ 2 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-06

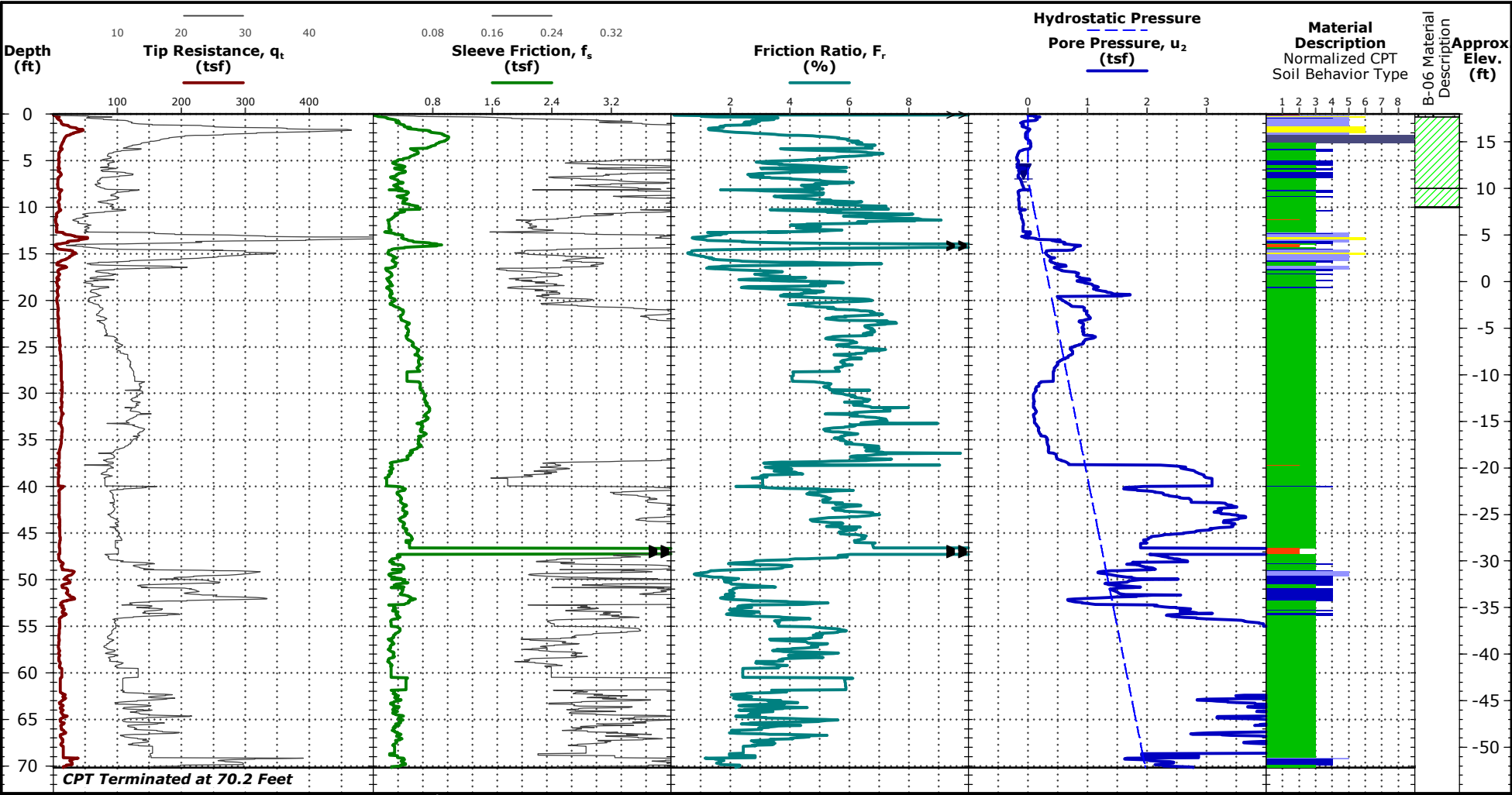
Latitude: 30.4588° Longitude: -91.2191°



2822 O'Neal Ln, Bldg B
Baton Rouge, LA

CPT Started: 3/25/2025
CPT Completed: 3/25/2025

Elevation: 18 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-06 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

7 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-07

Latitude: 30.4584° Longitude: -91.2194°

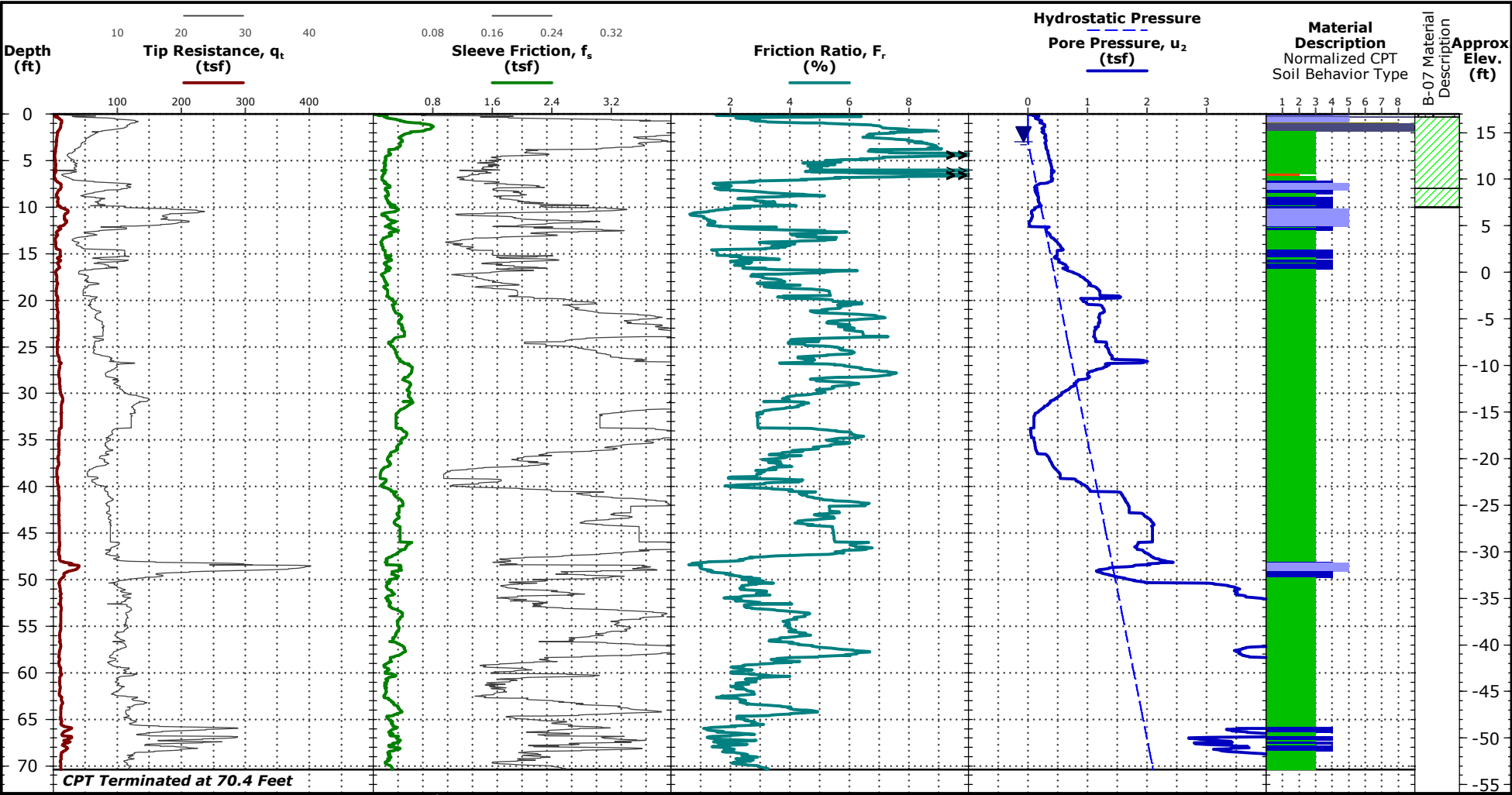


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

Elevation: 17 (ft) +/-

Elevation Reference: Elevations were estimated using Google Earth imagery.

CPT Started: 3/26/2025
CPT Completed: 3/26/2025



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-07 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

▼ 3 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-08

Latitude: 30.4581° Longitude: -91.2194°

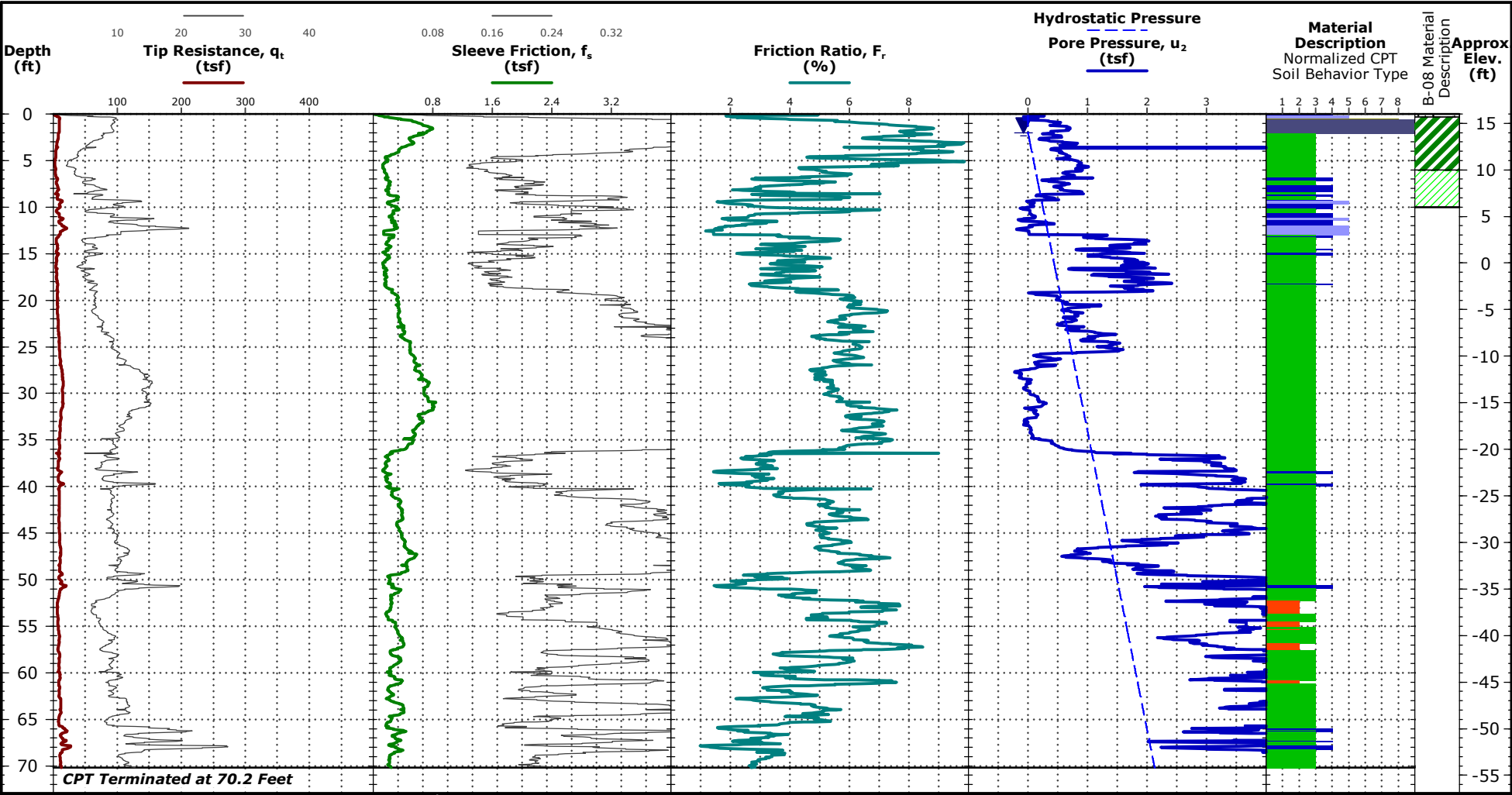


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

Elevation: 16 (ft) +/-

Elevation Reference: Elevations were estimated using Google Earth imagery.

CPT Started: 3/26/2025
CPT Completed: 3/26/2025



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-08 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

2 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-09

Latitude: 30.4584° Longitude: -91.2189°

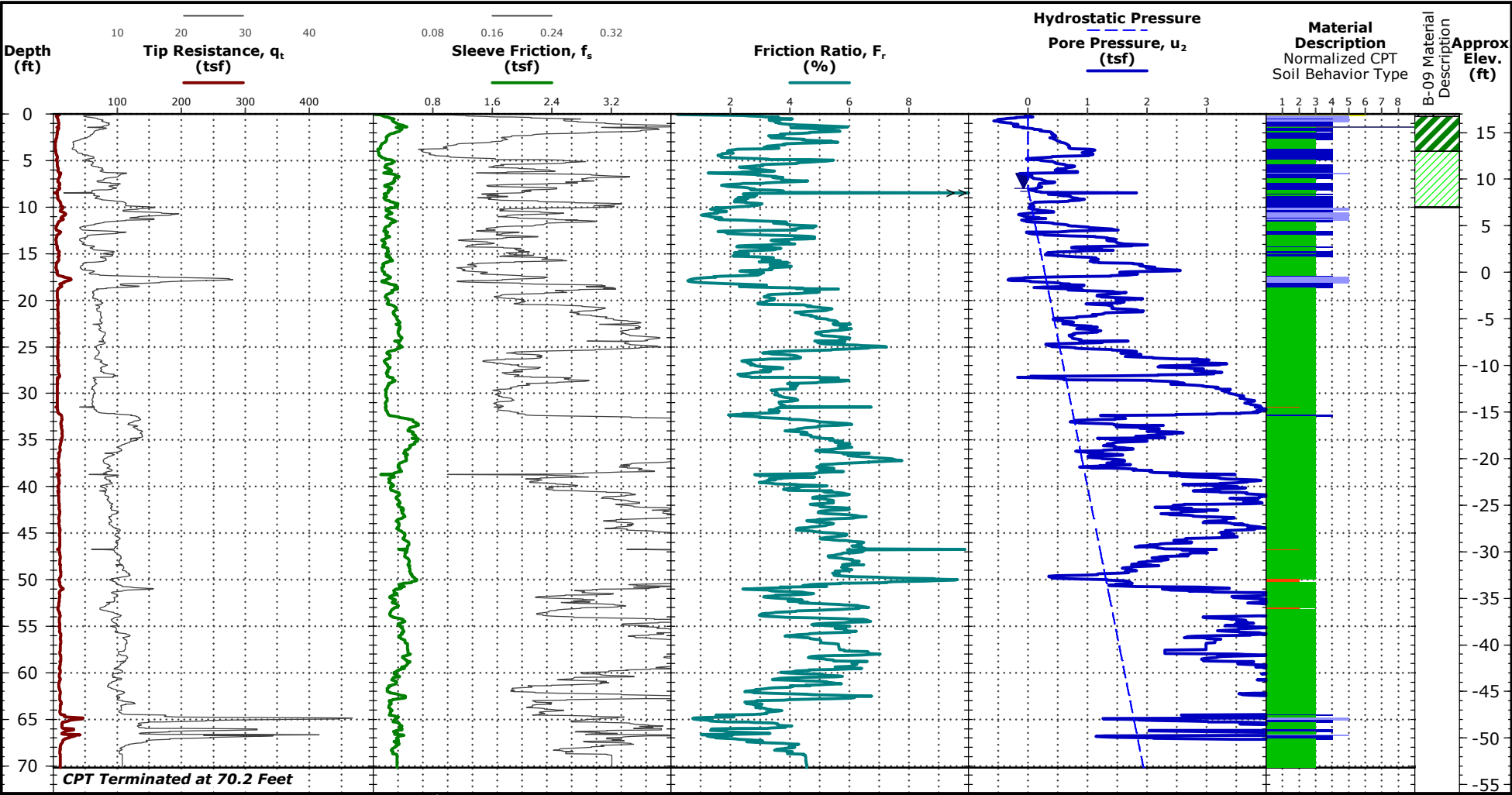


2822 O'Neal Ln, Bldg B
Baton Rouge, LA

Elevation: 17 (ft) +/-

Elevation Reference: Elevations were estimated using Google Earth imagery.

CPT Started: 3/26/2025
CPT Completed: 3/26/2025



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-09 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

8 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

CPT Sounding ID CPT-10

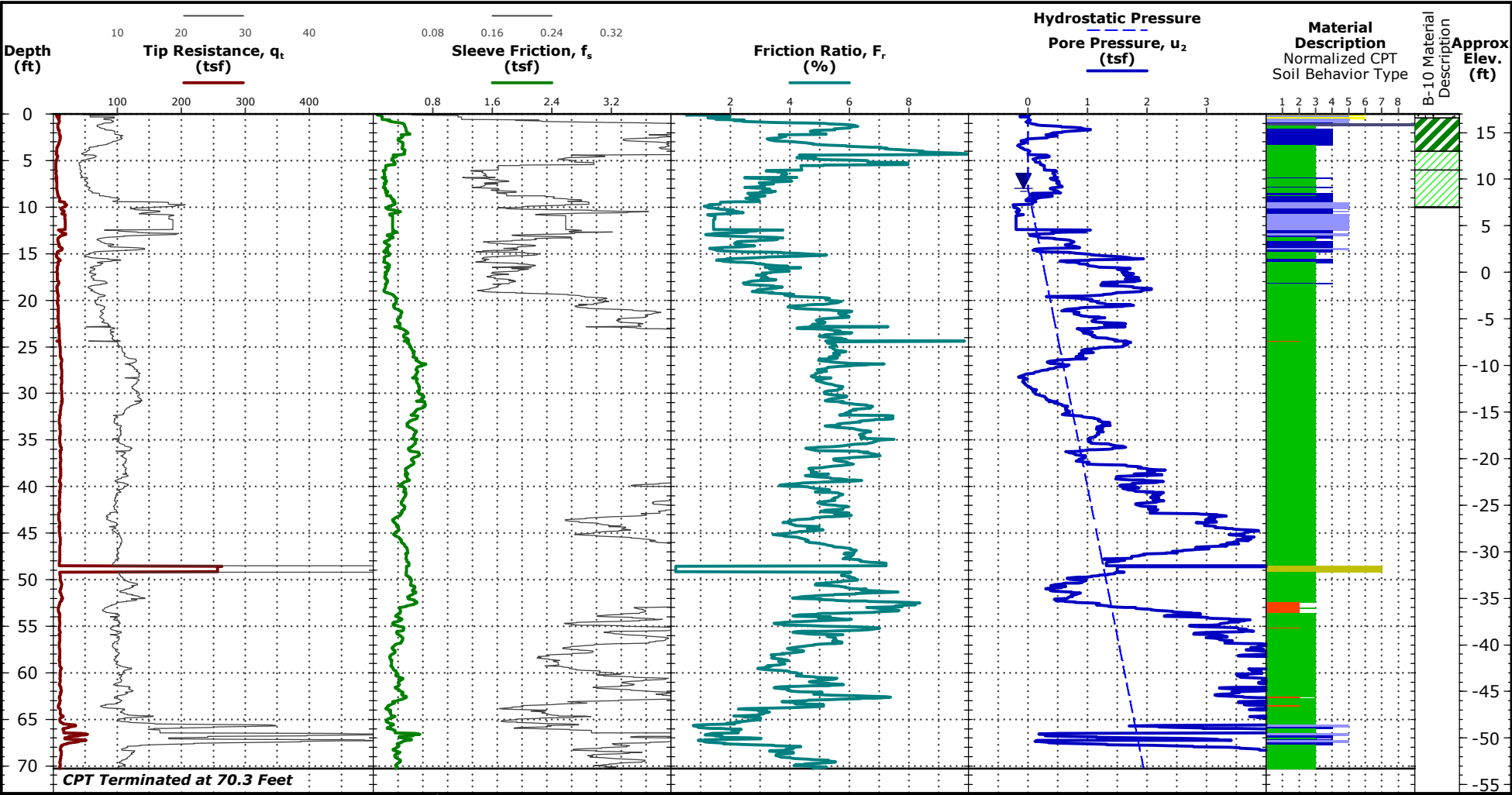
Latitude: 30.4582° Longitude: -91.2187°



2822 O'Neal Ln, Bldg B
Baton Rouge, LA

Elevation: 17 (ft) +/-
Elevation Reference: Elevations were estimated using Google Earth imagery.

CPT Started: 3/26/2025
CPT Completed: 3/26/2025



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data, if any.
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes

Test Location: See [Exploration Plan](#)
See B-10 for the adjacent test's full details.

CPT Equipment

CPT Rig: GP#1245
Operator: D. Gannfors
CPT sensor calibration reports available upon request
Probe No. 8003 with net area ratio of 0.848
U₂ pore pressure transducer location
Manufactured by Geoprobe Systems- Calibrated 12/24/2024
Tip and sleeve areas of 15 cm² and 225 cm²
No friction reducer

Water Level Observation

8 ft measured water depth
(used in normalizations and correlations)

Normalized Soil Behavior Type (Robertson 1990)

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravely sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

Supporting Information

Contents:

General Notes

CPT General Notes

Unified Soil Classification System

Note: All attachments are one page unless noted above.

General Notes

Sampling	Water Level	Field Tests
 Shelby Tube	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (tsf) (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

CPT GENERAL NOTES



DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

- Uncorrected Tip Resistance, q_c
Measured force acting on the cone divided by the cone's projected area
 - Corrected Tip Resistance, q_t
Cone resistance corrected for porewater and net area ratio effects
 $q_t = q_c + u_2(1 - a)$
Where a is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85
 - Pore Pressure, u
Pore pressure measured during penetration
 u_1 - sensor on the face of the cone
 u_2 - sensor on the shoulder (more common)
 - Sleeve Friction, f_s
Frictional force acting on the sleeve divided by its surface area
 - Normalized Friction Ratio, F_r
The ratio as a percentage of f_s to q_t , accounting for overburden pressure
- To be reported per ASTM D7400, if collected:
- Shear Wave Velocity, V_s
Measured in a Seismic CPT and provides direct measure of soil stiffness

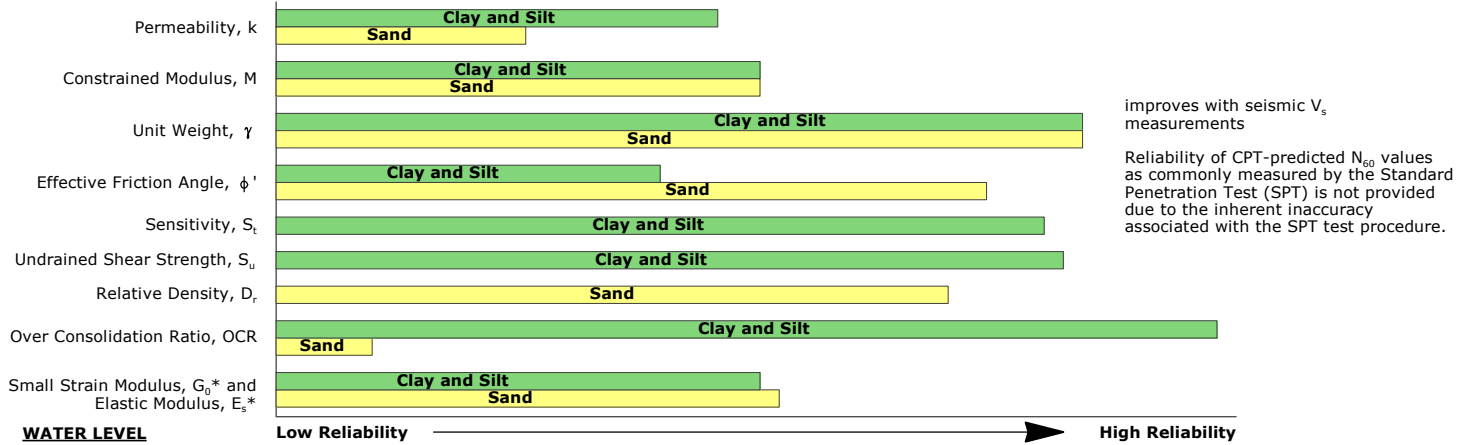
DESCRIPTION OF GEOTECHNICAL CORRELATIONS

- Normalized Tip Resistance, Q_{tn}
 $Q_{tn} = ((q_t - \sigma_{v0})/P_a)(P_a/\sigma'_{v0})^n$
 $n = 0.381(I_c) + 0.05(\sigma'_{v0}/P_a) - 0.15$
- Over Consolidation Ratio, OCR
 $OCR(1) = 0.25(Q_{tn})^{1.25}$
 $OCR(2) = 0.33(Q_{tn})$
- Undrained Shear Strength, S_u
 $S_u = Q_{tn} \times \sigma'_{v0}/N_{kt}$
 N_{kt} is a soil-specific factor (shown on S_u plot)
- Sensitivity, S_t
 $S_t = (q_t - \sigma_{v0}/N_{kt}) \times (1/f_s)$
- Effective Friction Angle, ϕ'
 $\phi'(1) = \tan^{-1}(0.373[\log(q_t/\sigma'_{v0}) + 0.29])$
 $\phi'(2) = 17.6 + 11[\log(Q_{tn})]$
- Unit Weight, γ
 $\gamma = (0.27[\log(F_r)] + 0.36[\log(q_t/\text{atm})] + 1.236) \times \gamma_{\text{water}}$
 σ_{v0} is taken as the incremental sum of the unit weights
- Small Strain Shear Modulus, G_0
 $G_0(1) = \rho V_s^2$
 $G_0(2) = 0.015 \times 10^{(0.55I_c + 1.68)}(q_t - \sigma_{v0})$
- Soil Behavior Type Index, I_c
 $I_c = [(3.47 - \log(Q_{tn}))^2 + (\log(F_r) + 1.22)^2]^{0.5}$
- SPT N_{60}
 $N_{60} = (q_t/\text{atm}) / 10^{(1.1268 - 0.2817I_c)}$
- Elastic Modulus, E_s (assumes $q_t/q_{\text{ultimate}} \sim 0.3$, i.e. $FS = 3$)
 $E_s(1) = 2.6\psi G_0$ where $\psi = 0.56 - 0.33\log Q_{tn, \text{clean sand}}$
 $E_s(2) = G_0$
 $E_s(3) = 0.015 \times 10^{(0.55I_c + 1.68)}(q_t - \sigma_{v0})$
 $E_s(4) = 2.5q_t$
- Constrained Modulus, M
 $M = \alpha_M(q_t - \sigma_{v0})$
For $I_c > 2.2$ (fine-grained soils)
 $\alpha_M = Q_{tn}$ with maximum of 14
For $I_c < 2.2$ (coarse-grained soils)
 $\alpha_M = 0.0188 \times 10^{(0.55I_c + 1.68)}$
- Hydraulic Conductivity, k
For $1.0 < I_c < 3.27$ $k = 10^{(0.952 - 3.04I_c)}$
For $3.27 < I_c < 4.0$ $k = 10^{(-4.52 - 1.37I_c)}$
- Relative Density, D_r
 $D_r = (Q_{tn} / 350)^{0.5} \times 100$

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include q_t , f_s , and u . Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. To this end, more than one correlation to a given parameter may be provided. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS



WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

Measured - Depth to water directly measured in the field

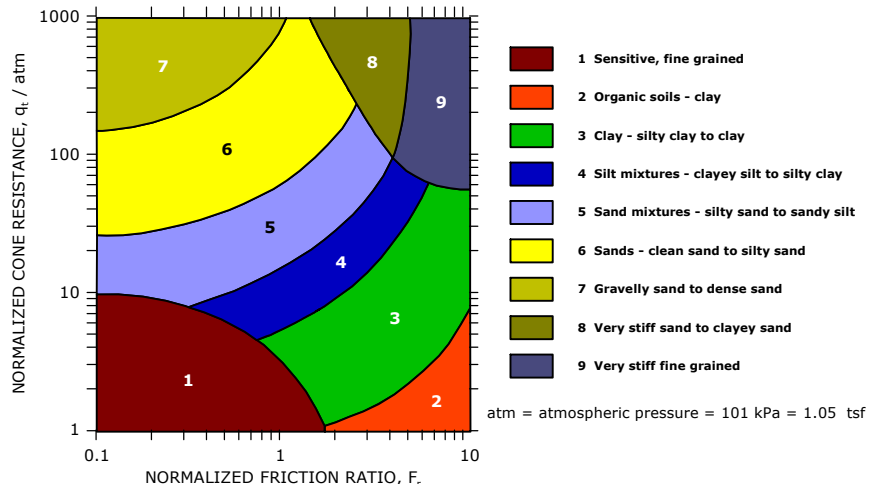
Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance (q_t), friction resistance (f_s), and porewater pressure (u_2). The normalized friction ratio (F_r) is used to classify the soil behavior type.

Typically, silts and clays have high F_r values and generate large excess penetration porewater pressures; sands have lower F_r 's and do not generate excess penetration porewater pressures. The adjacent graph (Robertson *et al.*) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



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Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu≥4 and 1≤Cc≤3 ^E	GW	Well-graded gravel ^F
			Cu<4 and/or [Cc<1 or Cc>3.0] ^E	GP	Poorly graded gravel ^F
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Cu≥6 and 1≤Cc≤3 ^E	SW	Well-graded sand ^I
			Cu<6 and/or [Cc<1 or Cc>3.0] ^E	SP	Poorly graded sand ^I
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots above “A” line ^J	CL	Lean clay ^{K, L, M}
			PI < 4 or plots below “A” line ^J	ML	Silt ^{K, L, M}
		Organic:	$\frac{LL\text{ oven dried}}{LL\text{ not dried}} < 0.75$	OL	Organic clay ^{K, L, M, N} Organic silt ^{K, L, M, O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line	CH	Fat clay ^{K, L, M}
			PI plots below “A” line	MH	Elastic silt ^{K, L, M}
		Organic:	$\frac{LL\text{ oven dried}}{LL\text{ not dried}} < 0.75$	OH	Organic clay ^{K, L, M, P} Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

- ^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

^E $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
- ^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

