

TYPE B3 SUBMITTAL
MS AIR NATIONAL GUARD
RENOVATE SUPPLY WAREHOUSE
PN: LRXQ172402
SPECIFICATIONS

SEPTEMBER 2023

Technical Specifications
for
Renovate Supply Warehouse
LRXQ172402
B3 Submittal

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SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Contractor's daily reports.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Other required submittals.
- I. Requests for Interpretation (RFI) procedures.
- J. Submittal procedures.

1.02 RELATED DOCUMENTS AND REQUIREMENTS

- A. Solicitation, Offer, and Award Document with all of its attached Sections.
- B. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
- C. Section 01 40 00 - Quality Requirements.
- D. Section 01 42 18 - Reference Documents.
- E. Section 01 60 00 - Product Requirements: General product requirements.
- F. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- G. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- H. Section 01 91 13 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.
 - 1. Where submittals are indicated for review by both Architect and the Commissioning Authority, submit one extra and route to Architect first, for forwarding to the Commissioning Authority.
 - 2. Where submittals are not indicated to be reviewed by Architect, submit directly to the Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.

1.03 PROJECT COORDINATION

- A. Project Coordinator: The General Contractor will designate one individual as Project Coordinator or Superintendent, as referred to in the General Conditions. **Prior to beginning work his name and qualifications will be submitted, in writing, to the Architect for approval.** Upon approval of the Architect and the Owner, he will remain until the project is completed and cannot be removed during construction without the written consent of the Owner and the Architect. If a new Superintendent is required the Contractor shall submit the new proposed replacement name and qualifications for approval. **Individuals without satisfactory experience and qualification may not be approved.**

- B. Cooperate with the Owner in allocation of mobilization areas of site; for field offices and sheds, for equipment access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with the Owner's procedures for intra-project communications as documented in Section 01 10 10 Basis of Collaboration, Part A; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.
- H. DUTIES OF PROJECT COORDINATOR
 - 1. General
 - a. Coordinate and direct the work of all subcontractors and material suppliers. Ensure that each subcontractor fully understands the technical requirements for their work, how it sequences and interfaces with other work and the timing and sequence of operations required for successful work.
 - b. Complete a pre review or pre construction meeting if required by the Specifications of all work prior to the start of any activity or trade. Identify and communicate coordination issues to all appropriate parties to assure a smooth informed assembly of work.
 - c. Coordinate all mock ups required by the Contract Documents.
 - d. Supervision: Supervise the activities of every phase of work taking place on the project including all subcontracts.
 - e. Complete and or confirm all layouts of dimensions for all trades and all subcontractors.
 - f. Mechanical/Electrical: Take special care to coordinate and supervise the work of the plumbing, heating and cooling and electrical subcontractors.
 - g. Communication: Establish lines of authority and communication at the job site.
 - h. The project coordinator must be present on the job all of the time or whenever the General Contractor or Subcontractors are completing work.
 - i. Assist in obtaining building and special permits required for construction.
 - 2. Interpretations of Contract Documents:

- a. Consultation: Consult with Architects and Engineers to obtain interpretations.
 - b. Assistance: Assist in resolution of any questions.
 - c. Transmission: Transmit written interpretations to concerned parties.
3. Project Communication
- a. All project communications shall be through the Project Managers. All Contractor and Subcontractor questions shall be directed to Duvall Decker Architects by the General Contractor Project Coordinator. All Communications from the Owner will be delivered to the Contractor by the Architect. No other instructions are contractually valid. No other person or entity is authorized to provide information on the Project.
 - b. All submittals, digital or physical, shall be delivered and picked up from to the project office (Duvall Decker Architects, P.A., 2915 North State Street, Jackson, Mississippi 39216).
 - c. No informal conversation, in person, via email or phone, shall be relied upon by the Contractor. The only reliable communications during construction are the Forms of Communication defined below.
 - 1) **Requests for Information (RFI)**: Generated by the Contractor for specific questions on the project. Submit all RFIs to Duvall Decker Architects, P.A., Project Manager. All RFI's must be in writing and must be answered in writing. Number RFIs sequentially and keep a status log and copies of all RFIs in the project trailer.
 - 2) **Bulletins**: Additional project information will be supplied by the Architect or Owner (through the Architect) in Bulletins. (If a change in scope or time is required, a change order may be requested or proposed by the Contractor). Bulletins will be numbered sequentially. Keep a status log and copies of all Bulletins in the project trailer.
 - 3) **Field Reports**: Field Reports documenting the progress and issues of construction will be distributed to the Contractor and all project team members by the Architect after field visits and will include digital photographs to illustrate the progress of construction. Field Reports will be numbered sequentially. Keep a status log and copies of all Field Reports in the project trailer.
 - 4) **Written Letters**: Letters may be generated by any party and copied to all project Team members. Any letters that may be required for contractual direction or notices must always be verified in a hard copy delivered via US mail or US certified mail.
4. Digital Communication: The Contractor shall establish a computer with an internet connection at the project job trailer with an email address, digital camera and printer for more effective communication. The Contractor may utilize Online Project Management Software to facilitate a limited number of its required communications with the Owner and Design Team. The setup of the software shall comply with the Construction Contract and with the formats, protocols, and processes described herein.
5. Cessation of Work: Stop all work not in accordance with the requirements of the Contract Documents.
6. Division One: Coordinate and assist in the preparation of all requirements of Division 1 and specifically as follows:
- a. Cutting and Patching: Supervise and control all cutting and patching for other trades' work.
 - b. Project Meetings: Schedule and preside at all project meetings. Take and distribute meeting minutes.

- c. Construction Schedule: Prepare and submit all construction schedules. Supervise work to monitor compliance with schedules.
 - d. Shop Drawings, Product Data and Samples: Administer the processing of all submittals required by the Project Manual.
 - e. Schedule of Values: Assist in preparation and be knowledgeable of each entry in the schedule of values.
 - f. Testing: Coordinate all required testing.
 - g. Temporary Facilities and Controls: Allocate, maintain and monitor all temporary facilities.
 - h. Substitutions and Product Options: Administer the processing of all substitutions.
 - i. Project Closeout: Conduct final inspections and assist in collection and preparation of Close Out Documents.
 - j. Cleaning: Direct and execute a continuing cleaning program throughout construction, requiring each trade to dispose of their debris.
 - k. Project Record Documents: Maintain up-to-date project record documents.
 - l. Enforce all safety requirements.
 - m. Complete Daily Reports as required in the Contract Documents.
7. Changes: Recommend and assist in the preparation of request to the Architect for any changes in the Contract.
 8. Application for Payment: Assist in the preparation and be knowledgeable of each entry in the Application and Certificate for Payment.
 9. Contractor's Monthly Reports and Monthly Owner Architect Contractor Meeting: Superintendent's Daily Project Reports shall be submitted with each Application for Payment. The Contractor shall lead a Monthly OAC meeting to completely review the status of the project. A Monthly Project Report shall be submitted at each Monthly OAC Meeting and shall include all Project Logs: Submittals, Bulletins, RFI's, CO's and Updated Project Schedule. The Contractor shall keep and distribute meeting minutes of the OAC meetings within 5 days of the meeting.
- I. Subcontractor's Duties
 1. The subcontractor is responsible to coordinate and supervise his employees in the work accomplished under his part of the contract and as it interfaces with other work. Follow the direction of the Project Superintendent and General Contractor.
 2. Schedules: Conduct work to assure compliance with construction schedules.
 3. Suppliers: Transmit all instructions to his material suppliers.
 4. Cooperation: Cooperate with the project coordinator and other subcontractors.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
 1. Owner.
 2. Architect.
 3. Contractor.
 4. All Major Subcontractors.
- C. Agenda:
 1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.
 4. Distribution of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Submission of Submittal log.
 6. Designation of personnel representing the parties to Contract, Owner and Architect.
 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 8. Site Mobilization, Campus Safety.
 9. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

- A. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Use of premises by Owner and Contractor.
 2. Owner's requirements.
 3. Construction facilities and controls provided by Owner.
 4. Temporary utilities provided by Owner.
 5. Survey and building layout.
 6. Security and housekeeping procedures.
 7. Schedules.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors as required.
- D. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.

4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

- A. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- B. Within 10 days after joint review, submit complete schedule.
- C. Submit updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

- A. Responsibility
1. The Contractor (Superintendent) shall keep a Daily Construction Report documenting the conditions which exist and the construction related activities which occur at the Project Site, for every Calendar Day, from the date of the Notice To Proceed through the Date of Final Acceptance. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
 2. For any day which is not a scheduled work day (Holiday, Saturday, Sunday) and during which no work was performed, the Contractor shall indicate on the report only the weather and site conditions which were known to exist on that day.
- B. Report Format
1. 8-1/2" x 11" pre-printed standardized form for reporting the required data. Contractor's standard Construction Report, Daily Log, or similar form, may be used when approved by Architect. Entries shall be printed or in a legible handwriting.
 2. The Daily Construction Report shall record the following information concerning events at Project site and project progress:
 - a. Contractor Identity: Name, Address, Phone, Fax, e-mail.
 - b. Project Identity: Name, Location, Architect's Project Number
 - c. Project Weather Conditions: Clear, partly cloudy, overcast, misting, light rain, heavy rain, hot, cold, warm, temperature range, wind, conditions. Include statement indicating impact of Weather Conditions on work scheduled for that day.
 - d. Site Conditions: Clear, muddy, dusty. Include statement indicating impact of Site Conditions on the work scheduled for that day.
 - e. Work in Progress (including work begun and completed) with names of entities performing work and number of employees present for each.

- f. Visitors to Site.
 - g. Problems encountered and disposition of each.
 - h. Summary of Architect's instructions.
 - i. Name and signature of Contractor's authorized representative who prepared the report.
 - j. List of subcontractors at Project site.
 - k. Major equipment at Project site.
 - l. Material deliveries.
 - m. Safety, environmental, or industrial relations incidents.
 - n. Meetings and significant decisions.
 - o. Unusual events (submit a separate special report).
 - p. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - q. Testing and/or inspections performed.
 - r. Signature of Contractor's authorized representative.
- C. REPORT DISPOSITION
- 1. Contractor shall keep the "original" of each daily report on file at the Project Site at all times and one copy at Contractor's Office. Monthly and Project Record submittals shall be in accordance with Heading D hereinafter.
- D. SUBMITTALS
- 1. Monthly Submittals
 - a. Contractor shall submit two (2) sets of copies of the Daily Project Reports with each monthly Application for Payment. One copy will be retained for the Architect and one copy will be forwarded to the Owner's Representative.
 - b. The days for which reports are submitted shall coincide with the days for which each Application for Payment is made and may not necessarily be 1st through 31st; could be, for example, 25th to 25th.
 - 2. Project Record Submittals: Contractor shall provide Two (2) bound sets, of the Daily Reports in accordance with Section 01700 – Project Closeout Documents.
 - 3. Closeout Document Submittal Format
 - a. One Digital and two hard copies in Binders: Commercial quality, 8 - 1 / 2" x 11", 3 - Three ring black binder.
 - b. Identification (Title Page): The first page following the clear cover shall include the following typed information:
 - 1) Project Identity.
 - 2) Contractor Identity
 - 3) Timer Period of Reports
 - 4) Dates ranges if in separate binders

3.06 COORDINATION DRAWINGS

- A. Subcontractors and the Contractor shall cooperate to prepare and provide the following coordination drawings and integrated BIM Model.
- B. COORDINATED CEILING SHOP DRAWING SUBMITTALS
 - 1. The Contractors shall prepare and provide reflected ceiling and above ceiling coordinated drawings showing all above ceiling construction, suspended and hard ceilings, access doors, lights, diffusers, exit signs, fire suppression heads, and all other devices. Each subcontractor shall contribute to these coordinated

shop drawings to locate their interaction in all ceilings. Submit a coordinated BIM Model and drawings with cut sheets for all items for review and approval by the Architect and Engineers. Note all conflicts or changes from the Contract Documents shall be noted. Once approved these coordinated ceiling shop drawings shall be used to locate all devices in ceilings on the project.

C. COORDINATED DRAWING SUBMITTALS

1. The Contractors shall prepare and provide multiple trade coordination drawings where installation placement of finished devices, or building components is required for design conformance and or where limited space availability necessitates maximum use of the space for efficient installation of different components such as all window/door to wall enclosure conditons or roof/wall , foundations to wall, or other critical flashing to water proofing conditions.

D. COORDINATED BELOW SLAB AND SLAB PENITRATION SUBMITTALS

1. The Contractors shall prepare and provide slab penetration drawings and coordinated drawings showing all below slab services and construction. Each subcontractor shall contribute to these coordinated shop drawings to locate their work in realtion to all other requirments. Each slab penetration shall be accuatly and dimensionally located.

- E. The Project Coordinatoreor shall Review drawings for completeness prior to submission to Architect.

3.07 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:

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

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 - c. Do not forward requests for information when the information is available inthe contract documents. Requets submitted where informaiton is available is not a legitimate cause for claiming additional costs or delays in execution of the work.
2. Prepare in a format and with content acceptable to Owner.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.

5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within a reasonable time to provide an answer. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Contractor is responsible to advise the Architect if an RFI response is due by a certain date or it will adversely effect the project schedule.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Architect and Owner.
 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

- A. For basic requirements refer to AIA Document A201, General Conditions of the Contract for Construction, Paragraph 3.12, "Shop Drawings, Product Data, and Samples."
- B. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.

- C. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- D. Samples will be reviewed for aesthetic, color, or finish selection.
- E. The Contractor shall submit all Shop Drawings and Samples requiring color or finish selections within thirty days of the Notice to Proceed. The Architect will hold these submittals in order to review all color and finish items together. Once all color and finish items are recieved, the Architect will review these submissions and provide selections to the Owner for review within fifteen working days. Color and Finish selections will only be made upon Owner approval. The Contractor shall notify the Architect if any of these items will adversely affect the schedule and the Architect will expedite the review of those items.
- F. The Contractor shall submit a schedule for the submission of all shop drawing, sample, and product information for the Architect's approval within 7 days of the Notice to Proceed. The schedule shall include a planned delivery date from subcontractor, general contractor review period, planned delivery date to Architect, Architect's review period and latest date needed for construction or material purchase.
- G. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.12 OTHER REQUIRED SUBMITTALS

- A. Subcontractor List

1. Within seven (7) days after award of the contract, the Contractor shall submit to the Architect in writing, a list of all subcontractors and portions of work to be performed by each.
 2. Subcontractors named shall be approved or disapproved in accordance with requirements of AIA Document A201, General Conditions of the Contract for Construction, Paragraph 5.2, "Award of Sub-contracts and Other Contracts for Portions of the Work."
- B. SUPERINTENDENTS QUALIFICATIONS
1. With or prior to the submission of the executed contract, the Contractor shall submit to the Architect in writing, the name and qualifications of the proposed Superintendent. The submission shall include name, contact information, resume, list of similar projects stating responsibility and at least 5 references with contact information. If after due investigation, the Architect and or Owner has reasonable objection to the proposed superintendent the Contractor shall propose another to whom the Architect and or Owner has no reasonable objection.
- C. SCHEDULE OF VALUES
1. The required schedule of values shall be submitted to the Architect in duplicate for approval before the first request for payment is made under the Contract. See Section 01370 for requirements.
- D. CONSTRUCTION SCHEDULE
1. For basic requirements, refer to AIA Document A201, General Conditions of the Contract for Construction, Paragraph 3.10, "Contractor's Construction Schedule."
 2. The required work progress schedule shall be submitted to the Architect in duplicate and approved before the first request for payment is made under the Contract.
 3. The schedule prepared by the Contractor shall fit within the number of calendar days for completion of the project as indicated in the Contract. It is hereby understood and mutually agreed that the Notice to Proceed issued by the Architect will be the start of the total time allowed for construction of the Project. On acceptance of the building by the Owner and issuance of the Certificate of Substantial Completion by the Architect, the time of completion of this Contract shall terminate.
 4. Once approved the Schedule base line shall not change. The contractor shall show progress in relation to the base line.
 5. The Contractor shall furnish copies of this schedule to all concerned contractors and subcontractors and they may use this schedule in scheduling and completing each phase of construction.
 6. The Contractor and all subcontractors are advised to strictly adhere to this schedule.
- E. GUARANTEES, WARRANTIES AND CERTIFICATES
1. For basic requirements refer to AIA Document A201, General Conditions of the Contract for Construction, Paragraph 3.5, "Warranty," Section 01700, Project Closeout, and various sections of these Specifications for specific sampling, testing, analyzing and reporting required.
 2. Submit all guarantees, warranties and certificates to the Architect for transmittal to the Owner.
- F. TEST REPORTS AND DATA

1. All test reports and data as required by the various sections of these Specifications and in accordance with Section 01400 shall be submitted to the Architect within three (3) days of the tests performed.
- G. OPERATING AND MAINTENANCE INSTRUCTIONS
1. Where indicated in the various sections of the Specifications, furnish operating and maintenance instructions. Forward the instructions to the Architect for review. Information to be submitted in triplicate should include the following:
 - a. Complete manufacturer's operating instructions and recommended cleaning and maintenance.
 - b. List of spare parts and materials for each piece of equipment recommended by manufacturer.
 - c. Name and address of authorized service organization and parts depot.
 - d. Where indicated in the various sections of the Specifications, provide the services of a factory trained operator to instruct the Owner's authorized representative in the operation, control and maintenance of the equipment.
- H. RECORD DRAWINGS
1. Upon completion of the project, the Contractor shall submit to the Architect two (2) sets of drawings marked to record all changes made during construction.
 2. All changes made during the actual construction of the project shall be indicated on the drawings in red pencil and the location of all piping, drainage, cleanouts, apparatus and equipment shall be indicated.

3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; 2 of which will be retained by Architect.
1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

- A. General Requirements:
1. Use a separate transmittal for each item.
 2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 5. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Deliver submittals to Architect at business address.

6. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 30 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 45 days.
 7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 8. Provide space for Contractor and Architect review stamps.
 9. When revised for resubmission, identify all changes made since previous submission.
 10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 12. Group all information required for a submittal, including shop drawings, product data, calculations, samples or other information, together for one full review. Incomplete and partial submittals per category of work or division will delay the Architects and consultants review and may delay the contractors work and schedule as it will take longer to complete each partial review. Failure to submit complete submittals voids a contractors claim for additional costs or delays in execution of the review of submittals and shop drawings.
 13. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. The Contractor shall submit for the approval of the Architect, accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work. No work shall be fabricated or installed by the Contractor until such approval has been given.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings and will be returned to the Contractor for resubmission.
 4. All shop drawings, submittals and product information shall be complete. If resubmission is required the complete submittal must be re-submitted. If isolated components or the submittal require re-submission, they must be marked as resubmitted within a complete resubmission of all materials.
 5. Drawings and schedules shall be submitted accompanied by letter of transmittal which shall give a list of the numbers and dates of the Drawings submitted. Drawings shall be complete in every respect and bound in sets. Unless items are otherwise listed it will be understood that all shop drawings for inter-related items will be submitted at the same time.
 6. The Shop Drawings shall be marked with the name of the project, numbered consecutively, and bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings

submitted without the stamp of approval will not be considered and will be returned to the Contractor for Resubmission.

7. The Contractor shall submit all Drawings and Schedules sufficiently in advance to allow ample time for checking, correcting, re-submitting, and re-checking.
 8. Shop Drawings shall be processed from subcontractor through the Contractor. No shop drawings shall be submitted to the Architect by a subcontractor or material supplier.
 9. The Shop Drawings shall be marked with the name of the project, numbered consecutively, and bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without the stamp of approval will not be considered and will be returned to the Contractor for Resubmission.
 10. The Contractor shall make every effort to provide shop drawings for construction and equipment conforming to the Contract Documents. The Contractor shall check shop drawings submitted by the subcontractor and material suppliers in order to determine their completeness and accuracy for construction purposes, prior to submission of such drawings to the Architect. Where changes from the Contract Documents are proposed, the Contractor shall indicate the difference in his submittal. The Contractor's check shall also determine whether or not the equipment will be compatible with his sequence of operation or the Owner's, if specified. If the equipment is not compatible with the intended or specified sequence, he shall notify the Architect.
 11. The Architect will review shop drawings submissions within a reasonable amount of time (except as noted above). The Architect will include all comments or corrections desired on the first transmittal. Thus, when drawings which need corrections are resubmitted, the Architect will be able to confine his attention to those items commented on in the previous submission.
Shop drawings, which are incomplete or indicate no attempt at conformance with the Contract Documents, shall not be submitted to the Architect for review. If incomplete shop drawings are submitted to the Architect, they will be returned to the Contractor without review.
 12. The approval of shop and setting drawings will be general and, except as otherwise provided in this section, shall not be construed as permitting any departure from the Contract requirements as relieving the Contractor of the responsibility for any errors in details, diversions, or otherwise that may exist; or as approving departures from additional details or instructions previously furnished by the Architect.
- D. Samples Procedures:
1. The Contractor shall furnish for the approval of the Architect any samples, required by the Specifications or that may be requested by the Architect, of any materials or equipment he proposes to use and shall prepay all shipping charges on the samples.
 2. No materials or equipment of which samples are required to be submitted for approval shall be used on the work until such approval has been given by the Architect, save only at the Contractor's risk and expense.
 3. Each sample shall have a label indicating the material represented, its place of origin and the name of the producer, the Contractor, and the project for which the material is intended. Samples of finished materials submitted shall be so marked as to indicate whether the materials represented are required by the drawings or specifications.
 4. A letter in duplicate submitting each shipment of samples shall be mailed under separated cover by the Contractor and contain a list of samples, the

- name of the project for which the materials are intended, and the trade names and manufacturers of the material.
5. The approval of any sample shall be only for the characteristics of for the uses named in such approval and no other. No approval of a sample shall be taken in itself to change or modify any contract requirement. When a material has been approved, no additional sample of that material will be considered and no change in brand or make will be permitted.
- E. Transmit each submittal with a copy of approved submittal form.
 - F. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
 - G. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
 - H. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
 - I. Deliver submittals to Architect at business address.
 - J. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - K. For each submittal for review, allow 30 days excluding delivery time to and from the Contractor.
 - L. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
 - M. Provide space for Contractor and Architect review stamps.
 - N. When revised for resubmission, identify all changes made since previous submission.
 - O. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
 - P. Submittals not requested will not be recognized or processed.

3.15 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.

- 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
- 2) Non-responsive resubmittals may be rejected.
2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.

1.02 RELATED SECTIONS

- A. General Conditions of the Contract for Construction.

1.03 REFERENCE STANDARDS

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

1.04 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- C. Within 10 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.
- E. Submit in PDF format.
- F. Submit under transmittal letter form specified in Section 01 30 00 - Administrative Requirements.

1.05 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide legend for symbols and abbreviations used.
- E. Coordinate with 01 20 00 - Pricing and Payment Procedures: Schedule of Values.

3.03 NETWORK ANALYSIS

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
 - 1. Preceding and following event numbers.
 - 2. Activity description.
 - 3. Estimated duration of activity, in maximum 15 day intervals.
 - 4. Earliest start date.
 - 5. Earliest finish date.
 - 6. Actual start date.
 - 7. Actual finish date.
 - 8. Latest start date.
 - 9. Latest finish date.
 - 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
 - 11. Monetary value of activity, keyed to Schedule of Values.
 - 12. Percentage of activity completed.
 - 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
 - 1. By preceding work item or event number from lowest to highest.
 - 2. By amount of float, then in order of early start.
 - 3. Listing of activities on the critical path.

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with the Owner and Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

3.07 RECOVERY SCHEDULE

- A. When the project is behind schedule, the Contractor shall submit a recovery schedule detailing how lost time is to be reclaimed,...etc.

END OF SECTION

**SECTION 01 35 53
SECURITY PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: use of premises and occupancy.

1.03 SECURITY PROGRAM

- A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with Owner's existing security system at project mobilization.
- C. Maintain program throughout construction period until Owner occupancy.

1.04 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Owner will control entrance of persons and vehicles related to Owner's operations.
- D. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

1.05 PERSONNEL IDENTIFICATION

- A. Provide identification badge to each person authorized to enter premises.
- B. Badge To Include: Personal photograph, name, assigned number, expiration date and employer.
- C. Maintain a list of accredited persons, submit copy to Owner on request.
- D. Require return of badges at expiration of their employment on the Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 40 50
PROJECT QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Definition of Project Quality Control.
- B. Administrative Procedures and responsibility requirements for achieving the quality required for the Work for The Project.

1.02 DEFINITION

- A. Project Quality Control: Defines as the continuing system of critical review and guidance of the Project construction, to ensure that the cooperative efforts of the involved Parties (include, but not limited to, the forces of contractors, subcontractors, suppliers, manufactures) shall result in procedures, services, workmanship and incorporated material and equipment, which will achieve the Project Quality ("Level of Excellence") required by the Contract Documents (in the whole or in part) for the complete work.

1.03 RESPONSIBILITY

- A. The General Contractor shall implement, monitor and maintain Project Quality Control from the beginning of the Project until The Work is complete.
- B. The General Contractor shall give special attention to the following items, with necessary coordination and monitoring to assure compliance with the requirements for each as outlined in Part 3 - Execution, below:
 - 1. Products.
 - 2. Workmanship.
 - 3. Manufacturers' Instructions, Certificated, and Field Services Representative.
 - 4. Mock-ups and Field Samples.
 - 5. Pre-Installation Meetings.
 - 6. Field testing
 - 7. Independent Roofing Manufacturer Inspections
 - 8. Project layout and dimensional coordination.
 - 9. Mechanical Plumbing, Electrical above ceiling coordination
- C. Neither the observation of the Architect in the administration of the Contract, nor tests and inspectors if the Testing Laboratory, nor approvals on submittals, shop drawings or by persons of any other agencies or entities, shall relieve the General Contractor from his obligation to provide The Work of the Project, in whole or in part, in accordance with the requirements of the Contract Documents.

1.04 SUBMITALLS

- A. Submit for the Architect review and approval Coordinated above ceiling shop drawings as described in 3.09 and in Section 01 30 00.
- B. Pre- Installation meeting minutes for each meeting shall be recorded and distributed by the General Contractor.
- C. Mock ups as required by the Specification Sections and Herein.

PART 2 - PRODUCTS / NOT USED**PART 3 - EXECUTION****3.01 PRODUCTS AND WORKMANSHIP**

- A. The Contractor shall require the quality of the products and workmanship for this Project shall comply with the requirements of Section 01600 - Material and Equipment.

3.02 MANUFACTURER'S INSTRUCTIONS

- A. The Contractor shall require full compliance with manufacturers', fabricators' and suppliers' instructions for every aspect and phase of the Work, including, but not limited to:
 - 1. Delivery, storage, handling and protection.
 - 2. Conditioning and preparation on Site.
 - 3. Installation, including remedial work.
 - 4. Cleanup and protection.
- B. Should instructions conflict with the requirements of the Contract Documents, request clarification from Architect/Engineer before proceeding.

3.03 MANUFACTURER'S CERTIFICATES

- A. When required by individual Specification Sections, submit manufacturer's certificate, in duplicate, executed by a responsible company officer and notarized, certifying that product meet or exceed specified requirements.

3.04 MANUFACTURER'S FIELD SERVICE REPRESENTATIVE

- A. When required by individual Specification Sections, manufacturer's or suppliers shall provide a qualified technical representative to serve as a "Field Representative" for required site visits and other necessary responsibilities, including, but not limited to , attending Pre-Installation Meeting and to observing field conditions (such as: conditions of surfaces and installation, quality of workmanship, start-up of equipment, and testing, adjusting, and balancing of equipment, as applicable) during and after construction (including warranty inspections).
- B. Representative's Qualifications:
 - 1. Full-time employee of Manufacturer.
 - 2. Fully knowledgeable of applicable Codes, Manufacturer's specified product (s) and installation requirements for each.
 - 3. Authorized to represent Manufacturer in all field decisions necessary to validate warranty.
- C. Immediately following each visit to site, Representative shall make a written report with observations and recommendations to Architect.

3.05 MOCK-UPS AND FIELD SAMPLES

- A. General: The Contractor shall provide mock-ups and field samples, as required by individual Specification Sections, to be placed at the site in locations designated by the Architect and complying with individual Specification Sections. In addition all work and materials and associated Specification Sections involved in the envelope enclosure of the buildings shall be coordinated in one mock up as described below.

3.06 PRE-INSTALLATION MEETINGS

- A. Schedule: When required by individual Specifications Sections or requested by the Architect, convene a pre-installation meeting at Project site, under provisions of Section 01041 and the following:

1. Convene minimum one (1) week or more prior to commencing the work of the trade, subcontractor or Specification Section.
2. Require attendance of Parties directly affected by work of the Section, including manufacturer's field representative, those providing fire rated assemblies and those with penetrating materials. Include if possible, local regulatory officials. **Include Subcontractors, foreman and skilled and unskilled laborers who will be involved in the work.**
3. Review all Specification requirements, workmanship and quality standards, tolerances, site conditions involving preparation and installation procedures, scheduling, coordination with related work, and regulatory inspections/approvals.

3.07 FIELD TESTING

- A. Schedule and coordinate all required Contractor and Special Testing for the project.

3.08 LAYOUT

- A. Contractor shall perform all layout of dimensions for all trades and Subcontractors. Contractor shall verify all clearances prior to installation of any subcontract work. If Contractors cannot adequately provide layout services than they shall at no expense to the Owner engage the services of a professional engineer or surveyor to complete the requirements for accurate layout.

3.09 ABOVE CEILING COORDINATED SHOP DRAWINGS - BIM MODEL

- A. The Contractor shall require and manage the completion of Coordinated Shop Drawings and Bim Model showing all above ceiling Mechanical, HVAC Plumbing, Sprinkler and Electrical / data systems and their interface each other and the building structure and substructure. The drawings shall show riser and shaft locations that may affect the distribution of the building services systems. Each system shall be shown in plan and section or marked to show top and bottom elevations. Each system shall show clearance between other trades and building structure and finishes. For the Contractors convenience systems are designed in stratified layers and these sections are shown in the Architectural Drawings. These stratification drawings are to aid the Contractor. The actual layout and levels may vary in congested areas. The Coordinated shop drawings shall show a clear path for all systems. If conflicts are discovered that cannot be solved by the contractor, identify on the Shop Drawings submittal for the Architects to make appropriate changes.

END OF SECTION

SECTION 01 42 18
REFERENCE DOCUMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Identification and purpose of Reference Documents.
- B. Administration procedures and responsibilities for the use of Reference Documents.

1.02 IDENTIFICATION AND PURPOSE

- A. Identification: Throughout the Contract Documents are references to nationally known and recognized Codes, Reference Standards, Reference Specifications, and similar documents which are published by regulatory Agencies, Trade and Manufacturing Associations and Societies, Testing Agencies and others. References also include certain Project Documents or designated portions, as noted.
- B. Purpose: All named and otherwise identified "Reference Documents" are "by reference" hereby incorporated into these Specifications as though fully written herein and thereby serve to establish specific requirements and pertinent characteristics for materials and workmanship as well as methods for testing/reporting on compliance thereto.

1.03 PROCEDURES AND RESPONSIBILITIES

- A. Compliance with Laws and Codes of governmental agencies having jurisdiction shall be mandatory and take precedence over the requirement of all other Reference Documents. For products of workmanship specified by Association, Trade, or Federal Standards, comply with requirements of the standard, except when supplemented instructions indicate a more rigid standard and/or define more precise requirements. Should specified reference standards conflict with the regulatory requirements or the Contract Documents, request Architect's clarification before proceeding.
- B. Since it is assumed that the Contractor (including any and all Parties furnishing and/or installing any portion of The Work) is familiar with the indicated codes and standards, it shall be the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify (and provide written certification, when required) that the items procured for use in this Work (and their installation, as applicable) meet or exceed the specified Requirements.
- C. The Architect has attempted to list near the beginnings of each Specifications Section (usually in Part 1 under heading entitled "REFERENCES") the abbreviations and/or acronyms of the Reference Documents which are indicated within the Section as applicable to the work of the Section. However, it shall be the Contractor's entire responsibility to call attention to and effect compliance with any code or standard which has its abbreviation or acronym listed elsewhere in the Section and inadvertently omitted from the list in Part 1 of any Specifications Section.
- D. When date of Reference Documents is not specified, confirmed to latest edition of said Document except when earlier editions are specifically required by codes.
- E. Obtain copies of Reference Documents, when required by Contract Documents, and maintain at jobsite during submittals, planning, and progress of the specified work, until in any reference document.

- F. The contractual relationship of the Parties to the Contract shall not be altered from the requirements of the Contract Documents by mention or inference otherwise in any reference document.

1.04 SCHEDULE OF REFERENCE DOCUMENTS

- A. Refer to individual Specifications Sections for Reference Documents applicable to the Work of the Section.

END OF SECTION

SECTION 01 45 33
CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1-01 DESCRIPTION

- A. The Contractor shall employ one or more special inspectors to provide inspections during construction and shall employ testing laboratory to perform all tests. All payments to special inspectors and testing labs shall be by Contractor. The special inspector shall be approved by the Owner, Architect, and Engineer.
- B. Special inspection and testing shall meet the requirements of the International Building Code Section 1704. Requirements and forms for structural inspections and testing are included.
1. Statement of Structural Special Inspections.
 2. Special Inspection Final Report.
 3. Qualifications of Inspections and Testing Technicians.
 4. Special Inspection Daily Report.
 5. Special Inspection Weekly Report.
 6. Special Inspection Discrepancy Notice.
 7. Structural Special Inspection Schedule.
 8. Wind Force Resisting Structure.
 9. Seismic Force Resisting Structure.
- C. Special inspections shall be approved by the Architect and Engineer. All reports shall be sent to the Contractor, Architect, Engineer, and Owner.
- D. Duties and Responsibilities
1. Signify presence at jobsite. Special inspectors should notify Contractor personnel of their presence and responsibilities at the jobsite. If required by the building official, they shall sign in on the appropriate form posted with the building permit.
 2. Observe assigned work. The special inspector shall observe assigned work for conformance with the building department approved (stamped) design drawings and specifications and applicable workmanship provisions of the International Building Code. Architect/Engineer-reviewed shop drawings may be used only as an aid to inspection.

For continuous special inspection, the special inspector shall be on site at all times observing the work requiring special inspection. Periodic inspections, if any, must have prior approval based on a separate written plan reviewed and approved by the Architect and Engineer and the registered design professional in responsible charge. Periodic inspection is intended to mean that the inspector at periodic times inspects all work performed but is not required to "witness" the work being performed.
 3. Report nonconforming items. The special inspector shall bring nonconforming items to the immediate attention of the Contractor, Architect, Engineer, and Owner and note all such

items in the daily report. If any item is not resolved in a timely manner or is about to be incorporated in the work, the special inspector shall immediately notify the registered design professional in responsible charge and post a discrepancy notice.

4. Provide timely reports. The special inspector should complete written inspection reports for each inspection visit and provide the reports on a timely basis. The special inspector or inspection agency shall furnish these reports directly to the Contractor, Architect, Engineer, Owner, and others as designated (See IBC Section 1704.1.2). These reports should be organized on a daily format and may be submitted weekly at the option of the building official. These reports should include:
 - a. Description of daily inspections and tests made with applicable locations;
 - b. Listing of all nonconforming items;
 - c. Report on how nonconforming items were resolved or unresolved as applicable; and
 - d. Itemized changes authorized by the architect, engineer, and building official if not included in nonconforming items.
5. Submit final report. The special inspector or inspection agency shall submit a final signed report to the Contractor, Architect, Engineer, and Owner stating that all items requiring special inspection and testing were fulfilled and reported and, to the best of his/her knowledge, in conformance with the approved design drawings, specifications, approved change orders and the applicable workmanship provisions of the International Building Code. Items not in conformance, unresolved items or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspections when continuous were required, etc.) shall be specifically itemized in this report.

E. Contractor Responsibilities

1. Notify the special inspector. The Contractor is responsible for notifying the special inspector or agency regarding individual inspections for items listed on the attached schedule and as noted on the building department approved plans. Adequate notice shall be provided so the special inspector has time to become familiar with the project.
2. Provide access to approved plans. The contractor is responsible for providing the special inspector access to approved plans.
3. Retain special inspection records. The Contractor is also responsible for retaining at the jobsite all special inspection records completed by the special inspector upon request.

STRUCTURAL SPECIAL INSPECTION SCHEDULE VERIFICATION AND INSPECTION OF FABRICATORS

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	Agent
		Continuous	Periodic			
1. Applicable Element (Fabricator Certification Requirements)	Yes		X		1704.2 1704.3 1704.6	
A. Structural Steel (AISC Certified For Conventional Steel Building) B. Steel Joists/ Joist Girders (SJI Member) C. Steel Roof Deck (SDI Member) D. Precast Concrete Wall Panels (PCI Group C Manufacturer with C3 Certification) E. Load Bearing Concrete Masonry (NCMA Member)						
2. When Special Inspections Are Required By The Building Official:	Yes		X			
A. Fabrication And Implementation Procedure: The Special Inspector Shall Verify That The Fabricator Maintains Detailed Fabrication And Quality Control Procedures That Provide A Basis For Inspection, Control Of The Workmanship, And The Fabricator's Ability To Conform To Approved Construction Documents And Referenced Standards. The Special Inspector Shall Review The Procedures For Completeness And Adequacy Relative To The Code Requirements For The Fabricator's Scope Of Work.						
3. When Special Inspections Are Not Required By The Building Official:	Yes		X			
A. Upon Completion Of Fabrication, The Approved Fabricator Shall Submit A Certificate Of The Complicance To The Building Official Stating That The Work Was Performed In Accordance With The Approved Construction Documents.						

STRUCTURAL SPECIAL INSPECTION SCHEDULE VERIFICATION AND INSPECTION OF SOILS

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Continuous	Periodic			
Verify materials below footings are adequate to achieve the design bearing capacity.	Yes		X	Geotech. Report	1704.7	
Verify excavations are extended to proper depth and have reached proper materials.	Yes		X		1704.7	
Perform classification and testing of controlled fill materials.	Yes		X		1704.7	
Verify use of proper materials, densities and lift thickness during placement and compaction of controlled fill.	Yes	X			1704.7	
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.	Yes		X		1704.7	

STRUCTURAL SPECIAL INSPECTION SCHEDULE VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Cont.	Periodic			
Inspection of reinforcing steel, including prestressing tendons, and placement.	Yes		X	ACI 318:3.5, 7.1-7.7	1913.4	
Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5b.	Yes			AWS D1.4 ACI 318: 3.5.2		
Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	Yes	X			1911.5	
Verifying use of required design mix.	Yes		X	ACI 318:Ch.4, 5.2-5.4	1904.2.2, 1913.2, 1913.3	
At the time fresh concrete is sampled to fabricate specimens for strength tests perform slump and air content tests, and determine the temperature of the concrete.	Yes	X		ASTM C 172, ASTM C 31, ACI 318: 5.6, 5.8	1913.10	
Inspection of concrete and shotcrete placement for proper application techniques.	Yes	X		ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8	
Inspection for maintenance of specified curing temperature and techniques.	Yes		X	ACI 318: 5.11-5.13	1913.9	
Inspection of prestressed concrete: a. Application of prestressing forces. b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	No	X	X	ACI 318: 18.20, ACI 318: 18.18.4		
Erection of precast concrete members.	No		X	ACI 318: Ch. 16		
Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	No		X	ACI 318: 6.2		
Inspect formwork for shape, location and dimensions of the concrete member being formed	No		X	ACI 318: 6.1.1		

STRUCTURAL SPECIAL INSPECTION SCHEDULE
VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION-TABLE 1

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Cont.	Periodic			
1. Material verification of high-strength bolts, nuts and washers:						
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	Yes		X	Applicable ASTM material specifications; AISC 360, Section A3.3		
b. Manufacturer's certificate of compliance required.	Yes		X			
2. Inspection of high-strength bolting:						
a. Bearing-type connections.	Yes		X	AISC 360, Section M2.5	1704.3.3	
b. Slip-critical connections.	Yes	X	X			
3. Material verification of structural steel:						
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	Yes			ASTM A 6 or ASTM A 568	1708.4	
b. Manufacturer's certified mill test reports.	Yes			ASTM A.6 or ASTM A 568		
4. Material verification of weld filler materials:						
a. Identification markings to conform to AWS specification in the approved construction documents.	Yes			AISC 360, Section A3.5		
b. Manufacturer's certificate of compliance required.	Yes					

STRUCTURAL SPECIAL INSPECTION SCHEDULE
VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION-TABLE 2

Verification and Inspection Task	Applicable To Project?	Frequency		Referenced Standard	Code Reference	
		Cont.	Periodic			
5. Inspection of welding:						
a. Structural steel:						
1) Complete and partial penetration groove welds.	Yes	X		AWS D1.1	1704.3.1	
2) Multipass fillet welds.	Yes	X				
3) Single-pass fillet welds > 5/16"	Yes	X				
4) Single-pass fillet welds ≤ 5/16"	Yes		X			
5) Floor and roof deck welds.	Yes		X	AWS D1.3		
b. Reinforcing steel:						
1) Verification of weldability of reinforcing steel other than ASTM A 706.	No		X	AWS D1.4, ACI 318: 3.5.2		
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	No	X				
3) Shear reinforcement.	No	X				
4) Other reinforcing steel.	No		X			
6. Inspection of steel frame joint details for compliance with approved construction documents:						
a. Details such as bracing and stiffening.	Yes				1704.3.2	
b. Member locations.	Yes					
c. Application of joint details at each connection.	Yes					

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Drinking Water
- C. Temporary telecommunications services.
- D. Temporary sanitary facilities.
- E. Temporary Controls: Barriers, enclosures, and fencing.
- F. Security requirements.
- G. Vehicular access and parking.
- H. Waste removal facilities and services.
- I. Field offices.
- J. Storage Sheds and Containers
- K. Furnishing and Maintenance of Equipment
- L. Removal of Utilities, Facilities, and Controls

1.02 RELATED REQUIREMENTS

- A. Section 00 95 00 - Additional Supplementary Conditions
- B. Section 01 51 00 - Temporary Utilities.

1.03 TEMPORARY UTILITIES

- A. Owner will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.

1.04 DRINKING WATER

- A. The General Contractor shall furnish and provide drinking water facilities for all workmen on the job. This shall include icing when required, paper cups, etc., all maintained in a sanitary condition.

1.05 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.
 - 3. Email: Account/address reserved for project use.
 - 4. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.

1.06 TEMPORARY SANITARY FACILITIES

- A. On all projects, the General Contractor shall provide and maintain required facilities and enclosures. Toilets are to be installed in strict accordance with the regulations of the State Board of Health. The toilets are to be located on the site as directed by

the Architect or his authorized representative. Provide at time of project mobilization.

- B. Maintain daily in clean and sanitary condition.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- E. Provide all necessary warning and danger lights from twilight to sunrise.
- F. All such barriers shall be in strict accordance with all legal requirements and laws.

1.08 FENCING

- A. Install temporary 6'-0" high galv. metal construction fencing & gates where shown. Fencing shall consist of 2-1/2" dia. Corner posts and 2" dia. Intermediate posts spaced at 10'-0" o.c. max. Posts shall extend into ground 3'-0" min. Typ. Provide 2" dia. Horiz. Post @ top of fence typ. Provide 1-1/4" dia. Horiz. Bracing posts @ mid-height each. Side of corner posts typ. Fencing to consist of galv. Wire fabric with continuous weather-resistant visual screen fabric. Employ 1/4"x3/4" galv. Stretcher bars and tension bands @ wire fabric ends typ. Intermediate attachments to be wire tied. Equip with vehicular and pedestrian gates with locks.

1.09 SECURITY - SEE SECTION 01 35 53

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- E. No burning of trash or debris shall be done on Owner's property. All such materials shall be removed from the site and disposed of in accordance with local laws and ordinances.

1.12 FIELD OFFICES

- A. Each Contractor shall be responsible for supplying, maintaining, and removing his own Field Office when directed: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table in locations on the site as directed by the Architect, or his authorized representative and best suited for their respective uses, as follows.
- B. The Field Office is for the use of the Contractor, Architect's representative, and Owner's representative.
- C. Provide space for Project meetings, with table and chairs____. Provide office with a desk with drawers for filing correspondence for each user, and a blueprint rack, all with suitable hardware; a door and window; and a minimum of 100 square feet.
- D. Provide a telephone, fax machine, answering machine, a digital camera and a computer with a scanner and printer and an internet connection and email address. The Contractor and computer system shall be capable of taking digital photographs or scanning drawings, downloading them to the computer and emailing them to the Architect.
- E. Maintain office in a sanitary and usable condition.
- F. Locate offices a minimum distance of 30 feet (10 m) from existing structures.

1.13 STORAGE SHEDS AND CONTAINERS

- A. The Contractor and subcontractor shall be responsible for supplying storage sheds and or containers with the appropriate environment for the materials stored.

1.14 FURNISHING AND MAINTENANCE OF EQUIPMENT

- A. Contractor shall furnish and maintain all equipment such as temporary stairs, ladders, ramps, scaffolds, hoists, runways, derricks, chutes, elevators, etc. as required for proper execution of the work of all trades. All such apparatus, equipment and construction shall meet all the requirements of the Labor Law and other state or local laws applicable thereto.

1.15 DEMOLITION

- A. The Contractor shall demolish all existing work required to complete the new work specified herein and as indicated on the drawings. Contractor shall assume ownership of said demolished materials and remove from site, except items chosen by the Owner to remain in his possession.

1.16 FIRE PROTECTION DURING CONSTRUCTION

- A. The Contractor shall provide and maintain in working order U. L. fire extinguishers having a 2A-20BC or equivalent rating in all temporary offices, storage sheds, and one such extinguisher per 3,000 square feet of building floor area under construction during the period of construction. Dry chemical type extinguishers shall not be used. Exit ways leading to building exits shall be maintained and kept free of all debris, materials, and equipment.
- B. Special precautions shall be taken to minimize the fire hazards when it becomes necessary to use stoves, salamanders, tar pots, or other temporary heating devices. Such devices shall conform to the requirements of the National Fire Code of the National Fire Protection Association and shall be used only when job is

attended. Such devices shall be located so that there is a clearance of not less than six feet above or less than two and one half feet on all sides between devices and unprotected combustible materials nor shall they be placed within ten feet (10') of tarpaulin or canvas covers. Legs of temporary heating devices shall be properly insulated when it is necessary to place such equipment on combustible platforms.

- C. Combustible materials shall not be stored near structural steel members until fireproofing has been installed. Forms of combustible material shall be stripped from reinforced concrete construction as soon as setting of the concrete will permit and shall be promptly removed from the building. The use of wood scaffolding shall be kept to a minimum and entirely eliminated when possible in order to eliminate fire hazards from this source. No part of the building where forms are in place shall be used for the storage of flammable materials of any kind.
- D. Special precautions shall be taken to reduce fire hazards where electrical or gas welding or cutting work is done and suitable fire extinguishing equipment shall be maintained near such operations.
- E. Paints, varnishes, volatile oils, etc., shall be stored in a room having good ventilation and containing no other material, or in U. L. listed metal lockers or metal boxes with self-closing covers. These cabinets shall be limited to a 60 gallon storage capacity with not more than three storage cabinets per area. Provide a 2A:20B:C rated fire extinguisher for protection in each of these areas. Gasoline and other volatile and flammable liquids shall be stored in a metal barrel well away from structures or other combustible materials.

1.17 MAINTENANCE AND REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work.
- B. Remove all such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Architect.
- C. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION CHECKS

PART 1 - GENERAL

1-01 DESCRIPTION

A. This work consists of furnishing, constructing and maintaining wattles for the retention of soil along the toe of fill slopes, around inlets, swale areas, small ditches, sediment basins and other areas as directed by the Contracting Officer in accordance with the requirements shown on the plans and these specifications. Also, the work includes removing and disposing of the erosion checks and silt accumulations as directed by the Contracting Officer.

PART 2 - MATERIALS

2-01 VEGETATIVE MATERIALS FOR MULCH

A. Wattles used around inlets shall have a minimum diameter of twelve inches (12") and a length adequate to meet field conditions. Wattles used at other locations shall have a minimum diameter of twenty inches (20") and a length adequate to meet field conditions. The stakes used in securing the wattles in place shall be placed approximately three feet (3') apart throughout the length of the wattle. Stakes shall be wooden and of adequate size to stabilize the wattles to the satisfaction of the Contracting Officer.

PART 3 - EXECUTION

3-01 GENERAL

A. The erosion checks shall be constructed at the locations and according to the requirements shown on the plans or as directed by the Contracting Officer. Erosion checks required along the toe of fill slopes shall be constructed prior to grading operations at the site. For other locations, the erosion checks shall be constructed when directed by the Contracting Officer.

3-02 MAINTENANCE AND REMOVAL

A. The Contractor shall maintain the erosion checks and remove and dispose of silt accumulations as directed by the Contracting Officer.

B. When the erosion checks are no longer needed, they shall be removed and the Contractor shall dispose of the silt accumulations and treat the disturbed areas in accordance with the contract requirements.

END OF SECTION
01 57 13

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SECTION 01 57 23

SILT FENCE

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This work consists of furnishing, construction and maintaining a water permeable filter type fence for the purpose of removing suspended soil particles from the water passing through it in accordance with the requirements shown on the plans and these specifications.

PART 2 - MATERIALS

2-01 GEOTEXTILE FABRIC

- A. Unless specified otherwise, the fabric may be woven or nonwoven. The fabric shall consist only of long chain polymeric yarns of filaments such as polypropylene, poly-ethylene, polyester, polyamide or polyvinylidene-chloride and shall be formed into a stable network such that the yarns or filaments retain their relative position. The fabric shall be mildew resistant and inert to biological degradation and naturally encountered chemicals, alkalies and acids. Fabric which is not protected from sunlight after installation shall contain stabilizers and/or inhibitors to make it resistant to deterioration from direct sunlight, ultraviolet rays and heat.
- B. The edges of the fabric shall be selvaged or finished in such a manner to prevent the outer yarn or filaments from raveling. The fabric shall be free of defects or flaws which affect the required physical properties.
- C. Fabric shall be manufactured in widths of not less than three feet. Sheets of fabric may be sewn or bonded together at the factory or other approved locations but deviation from the physical requirements will not be permitted.
- D. Tests for manufacturer's certification shall be conducted with fabric as shipped by the manufacturer and acceptance testing will be conducted with fabric from the project.
- E. The fabric shall conform to the physical requirements of Type I or II as shown in Table 1. Unless a specific type is specified in the plans or contract documents, the Contractor may select Type I or II.

2-02 WOVEN WIRE BACKING

- A. Except as provided herein, the silt fence shall be reinforced with a woven wire backing. The wire backing shall be at least 32 inches high and have no less than six horizontal wires. Vertical wires shall be spaced no more than 12 inches apart. The top and bottom wire shall be 10 gage or larger. All other wire shall be no smaller than 12-1/2 gage.

2-03 POSTS

- A. Wood or steel posts may be used. Wood posts shall have a minimum diameter of three inches and length of five feet and shall be straight enough to provide a fence without noticeable misalignment. Steel tee posts shall be five long, approximately 1-3/8 inches wide, 1-3/8 inches deep and 1/8 inch thick with a nominal weight of 1.33 pounds per foot prior to fabrication. The posts shall have projections, notches or holes for fastening the wire backing or fabric to the posts.

2-04 STAPLES

- A. Staples shall be made of nine gage wire with a minimum length of one inch after bending.

2-05 IDENTIFICATION

- A. Each roll of fabric or container shall be visibly labeled with the name of the manufacturer, type of fabric or trade name, lot number and quantity of material.

2-06 MANUFACTURER'S CERTIFICATION

- A. The Contractor shall furnish to the Contracting Officer three copies of the manufacturer's certified test reports and certification that each lot complies with the requirements of the contract. All fabric, steel pins, washers, fence posts, woven wire and wire staples are subject to approval by the Contracting Officer upon delivery to the work site and prior to incorporating in the work.

PART 3 - EXECUTION

3-01 PLACEMENT OF THE FENCE

- A. The silt fences shall be constructed at the locations shown on the plans or as directed by the Contracting Officer.
- B. All posts shall be installed so that no more than three feet of the post shall protrude above the ground. Extra post for bracing shall be installed as directed by the Contracting Officer. The woven wire shall be securely fastened to the wood posts with staples. When metal posts are used, the wire shall be fastened to the post with wire or other approved means. The bottom edge of the fabric shall be buried 6" below ground surface to prevent undermining. When splicing of the fabric is necessary, two posts shall be installed approximately 18" apart and each piece of fabric shall be fastened to both posts.

The fabric will be rejected if it has defects, rips, holes, flaws, deterioration, of damage incurred during manufacture, transportation, storage or installation

- C. Type II fabric may be installed without the woven wire fence backing provided all of the following conditions are met:
 - 1. Post spacing is reduced to six feet or less.
 - 2. The fabric has been approved by the Contracting Officer and the manufacturer recommends its use without the woven wire backing.
 - 3. Fence posts shall be inclined toward the runoff source at an angle of not more than 20° from vertical.
 - 4. Fabric shall be attached to the posts in such a manner that purpose intended is satisfied and maintained.

3-02 MAINTENANCE AND REMOVAL

- A. The Contractor shall maintain the silt fence and the fabric shall be removed and replaced when deteriorated to such an extent that it reduces the effectiveness of the silt fence.

- B. Unless otherwise directed, all temporary silt fences shall be removed. Upon removal, the Contractor shall remove and dispose of any excess silt accumulations, dress the area to give a pleasing appearance and vegetate all bare areas in accordance with the contract requirements. The temporary materials will remain the property of the Contractor and may be used at other locations provided the materials are acceptable to the Contracting Officer.

TABLE I
GEOTEXTILE FABRICS -- MINIMUM AVERAGE ROLL VALUE

Physical	Type Designation							Test Method
	I	II	III	IV	V	VI	VII	
Tensile Strength, lbs. Weaker principle direction	50	90	90	90	200	280	450	ASTM D 4632 (CRE) (See note 1)
Elongation at required strength, percent.	-	50 (max)	20	50	-	-	-	ASTM D 4632 (CRE) (See note 1)
Bursting Strength, psi	100	180	140	-	300	450	700	ASTM D 3786, Diaphragm Bursting Tester.
Puncture Strength, psi	-	-	35	-	80	110	180	ASTM D 3787, Tension Testing Machine with Ring Clamp; Steel Ball replaced with a 5/16 inch hemispherical tip.
Trapezoidal Tear, lbs	-	-	35	-	65	100	150	ASTM D 4533 (CRE) (See note 1)
Retained Strength when wet, percent	100	100	100	-	100	100	100	ASTM D 4632 (CRE) AND ASTM 3786 AND 3787, as above. (See note 1)
Thickness, mils.	-	-	-	40	-	-	-	ASTM D 1777
Weight, oz./sq. yd.	-	-	-	4-9	-	-	-	ASTM D 3766, Option A or B
Asphalt Retention, oz./ sq. ft.	-	-	-	3.0	-	-	-	Miss. Test Method MT 64
Maximum Change in Area, percent.	-	-	-	15	-	-	-	Miss. Test Method MT 64
Permeability, cm./sec.) See note 2)	-	-	.01	-	.01	.01	.01	AASHTO M 288 (Appendix)
Flow Rate, gal./min/sq. ft. (See note 2)	-	-	30	-	30	30	30	AASHTO M 288 (Appendix)
Equivalent Opening Size (EOS) (See notes 2 & 3) Woven Fabric NonWoven Fabric	20-100 20+	20-100 20+	40-100 40+	- -	70-100 70+	70-100 70+	70-100 70+	Miss. Test Method MT 60
Tensile Strength after Ultraviolet exposure, lbs.	40	80	-	-	-	-	-	ASTM D 4632 (CRE) after 500 hours exposure on xenon arc weatherometer as detailed in ASTM G 26 (See note 1)

Note 1: A test result shall be the average of the test values of five specimens.

Note 2: Unless designated otherwise in the plans of contract documents.

Note 3: The EOS test for nonwoven fabric may be waived by the Contracting Officer.

Note 4: All of the above strength tests except "retained strength" are to be conducted in a dry condition.

End of Section

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**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Transportation, handling, storage and protection.
- B. Product option requirements.
- C. Substitution limitations.
- D. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. See Section 01 40 00 - Quality Requirements, for additional source quality control requirements.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- B. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

- I. Comply with manufacturer's warranty conditions, if any.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, _____.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- B. Section 01 40 50 - Project Quality Control.
- C. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- D. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- E. Section 07 84 00 - Firestopping.
- F. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.
 - 2. Limitations on cutting structural members.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities.
- C. QUALIFICATIONS
 - 1. For demolition work, employ a firm specializing in the type of work required.
 - 2. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Mississippi.

1.04 EXISTING CONDITIONS

- A. PROJECT CONDITIONS
 - 1. Use of explosives is not permitted.
 - 2. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
 - 3. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - a. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

- b. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
4. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION

A. COORDINATION

1. See Section 01 10 00 for occupancy-related requirements.
2. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
3. Notify affected utility companies and comply with their requirements.
4. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
5. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
6. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
7. Coordinate completion and clean-up of work of separate sections.
8. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Periodically verify layouts by same means.
- E. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.

2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.
 2. Relocate items indicated on drawings.
 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Sanitary Sewer): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

3. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- I. Clean existing systems and equipment.
- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- B. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- C. Patching:
 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING AND CLEANING OF PREMISES

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. See Section 01 76 10 for temporary protective covering materials.
- B. Protect installed work from damage by construction operations.
- C. Provide special protection where specified in individual specification sections.
- D. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Scope: The work required under this section consists of the sequence of required inspections and closeout documents for substantial completion, and the requirements for final inspection and submission documents for final payment.
- B. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
 - 2. Provide copies to Owner.
- C. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. Contractor's Punch List
 - 1. Contractor shall submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
 - 2. The Contractor's Correction Punch List shall itemize all non-conforming and incomplete items, to include all General, Mechanical, and Electrical Items. Furnish Architects with Four (4) copies of Contractor's Punch List including all General, Mechanical and Electrical items.
 - 3. Furnish all subcontractors a typewritten list of non-conforming and incomplete items and the time in which items are to be corrected and completed.
 - 4. Contractor shall verify completion of all items on the Contractors Correction Punch List, including mechanical and electrical items. **Upon completion and verification**, Contractor shall notify the Architect in writing that all of the Contractors Punch List items are complete and the Project is ready for inspection and the Architects Punch List.
- F. Owner will occupy all of the building as specified in Section 01 10 00.
- G. Architect's Punchlist and Inspection
 - 1. Upon written notice from Contractor to Architect of completion of all Contractors' Punch List items, the Architect shall visit the site to verify that the Project is ready for the Architect's Inspection.
 - a. If it is determined at that time that the Project is ready for inspection, the Architect and Engineers will develop a Punch List, listing all incomplete or non-conforming items. Upon completion of the Architect's Punch List, Architect will transmit four (4) copies to the Contractor.

- b. If it is determined that the Project is not ready for a Punch List, the Architect will notify the Contractor to review the Project and Contract Documents and continue to correct and/or complete all non-conforming and incomplete work. This sequence will continue until the Project is ready for the Architects inspection. In accord with Owner/Architect Agreement, the Architect will invoice the Owner for Additional Services for each re-inspection and that amount will be passed on to the Contractor as liquidated damages as determined by the Owner.
- H. Owner's Punch List and Inspection
 1. Upon written notice from Contractor to Architect of completion of all Architects' Punch List items, the Architect shall visit the site to verify that the Project is ready for Owner's Inspection.
 - a. If it is determined at that time that the Project is ready for inspection, the Architect and Owner will develop a Final Punch List, listing all incomplete or non-conforming items. Upon completion of the Owners Punch List, Architect will transmit it to the Contractor.
 - b. If it is determined that the Project is not ready for an Owner's Punch List, the Architect will notify the Contractor to review the Project and Contract Documents and continue to correct and/or complete all non-conforming and incomplete work. This sequence will continue until the Project is ready for the Owner's inspection. In accord with Owner/Architect Agreement, the Architect will invoice the Owner for Additional Services for each re-inspection and that amount will be passed on to the Contractor as liquidated damages as determined by the Owner.
- I. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- J. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- K. Accompany Project Coordinator on Contractor's preliminary final inspection.
- L. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- M. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 SUBSTANTIAL COMPLETION

- A. Upon written notice from the Contractor to the Architect of the completion of all the Owners Punch List items, and when all other requirements are satisfied, the Architect and Owner shall determine if the project is Substantially Complete.
- B. If the Project is Substantially Complete at the time of the Owners Punch List and the Submission of the Closeout Documents has been approved, the Architect will prepare a Certificate of Substantial Completion Document with an attached list of incomplete or non-forming items and establish the number of calendar days that all Work is to be completed.
- C. If it is determined by the Owner that the Project is not substantially complete, the Architect shall notify Contractor, and Contractor shall continue until the project is complete and continue correcting incomplete and nonconforming punch list items. The Contractor shall notify the Architect for re-inspection when the building is Substantially Complete and schedule a re-inspection. This sequence will continue until the Project can be turned over to the Owner for its intended use as defined above and as determined by Owner and Architect. The Owner will be invoiced by

the Architect for Additional Service for each re-inspection and passed on to the Contractor as liquidated damages as determined by the Owner.

- D. Substantial Completion is defined in accordance the General Conditions 9.8.1, As the following: " Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with Contract Documents so the Owner can occupy or utilize the Work for its intended use".
- E. Prior to the Contractors request of an Owners inspection, the Closeout Documents shall submitted for review receive approval from the Architect. Note; Substantial completion shall not be established until all Closeout Documents have been submitted, checked and approved by the Architect.

3.15 CLOSEOUT DOCUMENTS

- A. In general Documents for Closeout are to be submitted by the Contractor to the Architect for transmittal to the Owner and shall be in triplicate (unless otherwise noted), and shall be but are not limited to, the following:
 - 1. Documents required by all Local State, Federal Governmental Authorities having jurisdiction.
 - 2. Copies of all required Test Reports.
 - 3. Certification that all Work by the General and all Subcontractors has been inspected for compliance with Contract Documents and all General, Mechanical, Electrical Punch List items are complete.
 - 4. Contractors Daily Reports – Two (2) bound sets of copies.
 - 5. Contractor's and Subcontractor's one (1) year guarantee against all defects in materials and workmanship.
 - 6. Copies of all individual guarantees, warranties and certificates required by the Specifications.
 - 7. Copies of all approved Shop Drawings and Submittals.
 - 8. As- Builts- **Two (2) sets of Construction Document prints** that are marked with red pencil to show all departures from original Drawings **AND a digital copy PDF** marked with red to show all departures from original Drawings.
 - 9. Additional Documents as may be specified within Contract Documents.
 - 10. Two (2) indexed copies of all shop drawings, parts lists, warranties, equipment brochures, operating instructions, etc., bound and covered in manner acceptable to Architect.
 - 11. Invoices for all items for which allowances are specified.
 - 12. Affidavit certifying that no asbestos containing materials have been installed by the Contractor or Subcontractors on this project.
 - 13. Furnish delivery and acceptance receipt from the Owner for extra, paint, and all other overstock items required by the contract documents.
 - 14.
 - 15. Submit Contractor Payment of Debts and Claims. (AIA Form G706). General Contractor, each Subcontractor, and Supplier.
 - 16. Submit Contractor's Affidavit and Release of Liens. (AIA Form G706A). General Contractor, each Subcontractor, and Supplier.
 - 17. Submit Consent of Surety for Release of Final Payment to Contractor. (AIA Form G707).

3.16 FINAL PAYMENT

- A. Contractor shall submit final application for payment after Substantial Completion has been established. If incomplete or non conforming work remains the Owner may deduct amounts to cover the cost of those items. When all work is complete

and approved the Contractor can submit a final Application for Payment. Owner will make Final Payment upon certification by Architect.

- B. Final Acceptance of the Project does not relieve the Contractor of fulfilling the terms and conditions of the Contract Documents.

END OF SECTION

**SECTION 01 71 13
MOBILIZATION – DEMOBILIZATION**

PART 1 - GENERAL

1-01 DESCRIPTION

- A. Mobilization-Demobilization shall consist of all moving in, including preparatory work and operations and moving out, including all dismantling and clean-up work and operations performed by the Contractor.
- B. Mobilization shall include the movement of all labor, equipment, supplies and incidentals to the project site; establishment of facilities necessary for work on the project; and other work and operations which must be performed or costs not directly attributable to other pay items, exclusive of bidding costs, which must be incurred by the Contractor before beginning and during the early stages of production work on the project site.
- C. Demobilization shall include the movement of all labor, equipment, supplies and incidentals from the project site; dismantling and removal of temporary facilities; clean-up of the project site and all work areas; and other work and operations which must be performed or costs not directly attributable to other pay items which must be incurred by the Contractor after completion of certain items of work and all other work on the Contract has been completed.

PART 2 - COMPENSATION

2-01 MEASUREMENT

- A. The percentage of the lump sum amount for this section will be measured in accordance with the Schedule of Values submitted by the Contractor and approved by the Contracting Officer within the following limitations:

% of Total Contract Earned*	% of Maximum Lump Sum This Item Allowed
10%	40%
25%	60%
80%	90%

- B. When all work under this Contract is completed by the Contractor and accepted by the Contracting Officer, one hundred percent (100%) of the Lump Sum Amount will be allowed.

* Total Contract earned will be equal to certified estimates approved by the Contracting Officer exclusive of the Mobilization-Demobilization Lump Sum and Materials Stored Amounts.

End of Section

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**SECTION 01 73 00
EXECUTION**

PART 1 - GENERAL

1-01 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.

1-02 SUMMARY

- B. 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.
9. Correction of the Work.

- C. Related Requirements:

1. None

1-03 DEFINITIONS

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

1-04 INFORMATIONAL SUBMITTALS

- F. Qualification Data: For land surveyor or professional engineer.
- G. Certificates: Submit certificate signed by certifying that location and elevation of improvements comply with requirements.
- H. 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.

- I. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1-05 QUALITY ASSURANCE

- J. 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
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are

not limited to the following:

- a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- K. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. 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

3-01 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. 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.

- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3-02 PREPARATION

- D. Existing Utility Information: Furnish information to local utility and Owner 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.
- E. 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.
- F. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- G. 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.

3-03 CONSTRUCTION LAYOUT

- H. 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.
- I. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- J. 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.

3-04 INSTALLATION

- K. 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.
- L. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- M. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- N. 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.
- O. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- P. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- Q. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- R. 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.
- S. 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.
- T. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3-05 CUTTING AND PATCHING

- U. 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.
- V. 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.
- W. Temporary Support: Provide temporary support of work to be cut.
- X. 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.
- Y. 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 011000 "Summary."
- Z. 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.
- AA. 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.
- BB. 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.
- CC. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
- 3-06 OWNER-INSTALLED PRODUCTS
- DD. Site Access: Provide access to Project site for Owner's construction personnel.
- EE. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.
- 3-07 PROGRESS CLEANING
- FF. 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.

GG. Site: Maintain Project site free of waste materials and debris.

HH. 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.

II. 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.

JJ. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

KK. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

LL. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

MM. 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.

NN. 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.

OO. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3-08 STARTING AND ADJUSTING

PP. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

QQ. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

RR. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3-09 PROTECTION OF INSTALLED CONSTRUCTION

SS. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

TT. Comply with manufacturer's written instructions for temperature and relative humidity.

3-10 CORRECTION OF THE WORK

UU. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

VV. Restore permanent facilities used during construction to their specified condition.

WW. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

XX. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

YY. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

- ZZ. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3-11 PROTECTION OF INSTALLED CONSTRUCTION

- AAA. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

- BBB. Comply with manufacturer's written instructions for temperature and relative humidity.

3-12 CORRECTION OF THE WORK

- CCC. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

- 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

- DDD. Restore permanent facilities used during construction to their specified condition.

- EEE. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- FFF. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

- GGG. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

SECTION 01 81 13
SUSTAINABLE DESIGN REQUIREMENTS

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 general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain LEED “ANG Meritable” certification based on USGBC's LEED 2009.

1. Specific requirements for LEED may also be included in other Sections.
2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

- a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.

- B. LEED Goals:

1. A copy of the LEED Project scoresheet is attached at the end of this Section that indicate the points to be achieved by the Project.

1-03 ADMINISTRATIVE REQUIREMENTS

- A. Work of this project includes compiling all documentation required for submission for the LEED certification. Work is not complete until Government has received all documentation required for LEED certification.

1. Provide documentation required by LEED and LEED review.

- B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.

- C. Respond to questions and requests for additional information from Contracting Officer and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.
- D. LEED Conference: Schedule and conduct a conference at a time convenient to Government within 21 days prior to commencement of the work.
 - 1. Attendees: Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
 - 3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1-04 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.
 - 1. Submit each LEED submittal simultaneously with applicable product submittal. B.

LEED Documentation Submittals:

- 1. General, Sustainable Materials Attributes Form: Project submittals must be accompanied by a completed Sustainable Materials Attributes Form. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the Sustainable Materials Attributes Form.
 - a. Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
- 2. Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance.
- 3. Construction and Demolition Waste Management: Comply with the industry standards for "Construction Waste Management and Disposal."
- 4. Building Product Disclosure and Optimization: Environmental Product Declarations complying with LEED requirements.
- 5. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 1, Raw Material Source and Extraction Reporting.
 - a. Corporate sustainability reports for products that comply with LEED requirements for raw material and source extraction reporting.

6. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices.
 - a. Extended Producer Responsibility: Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
 - b. Bio-Based Materials: Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
 - c. Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
 - d. Materials Reuse: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
 - e. Recycled Content: Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement of costs.
7. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
 - a. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting, including but not limited to the following:
 - 1) Manufacturer Inventory.
 - 2) Health Product Declaration.
 - 3) Cradle to Cradle certifications.
 - 4) Declare product labels.
 - 5) ANSI/BIFMA e3 Furniture Sustainability Standard.
8. Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.
 - a. Documentation for products that comply with LEED requirements for material ingredient optimization, including but not limited to the following:
 - 1) GreenScreen Benchmarks.
 - 2) Cradle to Cradle certifications.
 - 3) REACH optimizations.
9. Indoor Air Quality: Comply with the industry standards for "Indoor Air Quality Management."
10. Low-Emitting Materials: Product data, indicating VOC content and emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:

- a. Paints and coatings.
- b. Adhesives and sealants.
- c. Flooring.
- d. Products containing composite wood or agrifiber products or wood glues.
- e. Ceilings, walls, thermal, and acoustic insulation.
- f. Exterior applied materials.
- g. Furniture.

1-05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:
 - 1. Wood construction materials.
 - 2. Furniture.
 - 3. Passive plumbing materials.
 - 4. Passive mechanical (HVAC) materials.
 - 5. Passive electrical materials.
 - 6. Earthwork and exterior improvements, hard costs.
- C. LEED Action Plan: Provide preliminary submittals within 30 days of the Notice to Proceed indicating how the LEED requirements will be met.
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following.
 - 1. Submit LEED documentation to the Government with each Application for Payment.

1-06 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2-01 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.

1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.

2-02 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:

1. Product-Specific Declaration: Valued as one quarter (1/4) of a product.
2. Industry-Wide (Generic) EPD: Valued as one half (1/2) of a product.
3. Product-Specific Type III EPD: Valued as one whole product.

B. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 1, Raw Material Source and Extraction Reporting. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:

1. Corporate sustainability reports.

C. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices. Provide products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project:

1. Extended producer responsibility program.
2. Bio-based materials.
3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
 - a. Rough carpentry.
 - b. Miscellaneous carpentry.
 - c. Heavy timber construction.
 - d. Wood decking.

- e. Metal-plate-connected wood trusses.
- f. Structural glued-laminated timber.
- g. Finish carpentry.
- h. Architectural woodwork.
- i. Wood paneling.
- j. Wood veneer wall covering.
- k. Wood flooring.
- l. Wood lockers.
- m. Wood cabinets.
- n. Furniture.

4. Materials Reuse: The following materials may be salvaged, refurbished, or reused materials:

- a. Mechanical VAV controls

5. Recycled content.

- a. Exceptions: Do not include fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.

D. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

1. Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

- a. Manufacturer Inventory.
- b. Health Product Declarations (HPDs).
- c. Cradle to Cradle (C2C) certifications.
- d. Declare product labels.
- e. ANSI/BIFMA e3 Furniture Sustainability Standard.

E. Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.

1. Use products that document their material ingredient optimization using the paths below for at least 25%, by cost, of the total value of permanently installed products in the project, which meet one of the following disclosure criteria:

- a. GreenScreen benchmarks.
- b. Cradle to Cradle certifications.
- c. REACH optimizations.

2-03 LOW-EMITTING MATERIALS

A. Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health, (CDHP), Standard Method v1.1-2010, using the applicable exposure scenario. Manufacturer’s documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:

- 1. 0.5mg/m3 or less,
- 2. between 0.5 and 5.0 mg/m3 or, 3. 0.50 mg/m3 or more.

B. Low-Emitting Materials, Paints and Coatings: For field applications that are outside the weatherproofing system, use paints and coatings that comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.

Product Type:	Allowable VOC Content (g/L):
Bond Breaker	350
Clear wood finishes - Varnish	275
Clear wood finishes – Sanding Sealer	275
Clear wood finishes - Lacquer	275

Colorant – Architectural Coatings, excluding IM coatings	50
Colorant – Solvent Based IM	600
Colorant - Waterborne IM	50
Concrete – Curing compounds	100
Concrete – Curing compounds for roadways & bridges	350
Concrete surface retarder	50

Driveway Sealer	50
Dry-fog coatings	50
Faux finishing coatings - Clear topcoat	100
Faux finishing coatings – Decorative Coatings	350
Faux finishing coatings - Glazes	350
Faux finishing coatings - Japan	350
Faux finishing coatings – Trowel applied coatings	50
Fire-proof coatings	150
Flats	50
Floor coatings	50
Form release compounds	100
Graphic arts (sign) coatings	150
Industrial maintenance coatings	100
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – Non-sacrificial antigrffiti coatings	100
Industrial maintenance coatings – Zinc rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-color coatings	250
Non-flat coatings	50
Pre-treatment wash primers	420
Primers, sealers and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50

Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	100
Stone consolidant	450
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Swimming pool coatings – repair	340
Swimming pool coatings – other	340
Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood preservatives	350
Low solids coatings	120

C. Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Low-Emitting Materials, Adhesives and Sealants: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005:

Architectural Applications:	Allowable VOC Content (g/L):
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150

Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Dry wall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single ply roof membrane adhesives	250
Specialty Applications:	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Computer diskette manufacturing	350
Contact adhesive	80
Special purpose contact adhesive	250
Tire retread	100
Adhesive primer for traffic marking tape	150
Structural wood member adhesive	140
Sheet applied rubber lining operations specialty	850
Top and Trim adhesive	250
Substrate Specific Applications:	
Metal to metal substrate specific adhesives	30
Plastic foam substrate specific adhesives	50

Porous material (except wood) substrate specific adhesives	50
Wood substrate specific adhesives	30
Fiberglass substrate specific adhesives	80
Sealants:	
Architectural sealant	250
Marine deck sealant	760
Nonmember roof sealant	300
Roadway sealant	250
Single-ply roof membrane sealant	450
Other sealant	420
Sealant Primers:	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
Other sealant primer	750
Other	
Other adhesives, adhesive bonding primers, adhesive primers or any other primers	250

1. Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

- E. Low-Emitting Materials, Adhesives and Sealants: For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Low-Emitting Materials, Flooring: Flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Low-Emitting Materials, Composite Wood: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne

Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

- H. Low-Emitting Materials, Ceilings, Walls, Thermal, and Acoustic Insulation: Ceilings, walls, and thermal insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Low-Emitting Materials, Exterior Applied Materials: At least 90 percent of exterior applied materials, measured by volume, shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 1. The following materials are prohibited and do not count toward total percentage compliance:
 - a. Hot-mopped asphalt for roofing.
 - b. Coal tar sealants for parking lots and other paved surfaces.
- J. Low-Emitting Materials, Furniture: At least 90 percent of furniture, measured by cost, shall be tested in accordance with ANSI/BIFMA Standard Method M7.1-2011; comply with ANSI/BIFMA e32011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach; and model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. K. Additional Low-Emitting Requirements:
 - 1. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
 - 2. If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
 - 3. Methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

2-04 INDOOR WATER USE REDUCTION

- A. Indoor Water Use Reduction, Appliances: Provide ENERGY STAR or performance equivalent appliances.
Indoor Water Use Reduction, Plumbing Fixtures: Do not exceed water flow requirements indicated in Division 22 - PLUMBING.

PART 3 - EXECUTION

3-01 NONSMOKING BUILDING

A. Environmental Tobacco Smoke Control: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

3-02 CONSTRUCTION WASTE MANAGEMENT

A. Construction and Demolition Waste Management: Comply with the industry standards for "Construction Waste Management and Disposal."

3-03 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Construction Indoor Air Quality Management Plan: Comply with the industry standards for "Indoor Air Quality Management."

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SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

1.02 DESCRIPTION OF WORK

- A. Demolition is the complete removal of existing features as required to provide for the specified construction. The Contractor shall patch, trim-out, refinish, or otherwise prepare and restore to its original condition existing work partially demolished which is to remain, receive new finish, connect to, or be a part of existing or new work. Extent of demolition work includes all materials as indicated on Drawings and/or herein indicated or inferred for the installation of new work.
- B. Removal of all material from Owner's property.
- C. Dispose of all materials legally. Comply with all Federal, State, City and all other Governing Authorities. Contractor is responsible for including in their bid all fees associated or required to fulfill the requirements of all demolition and disposal work.

1.03 TYPES OF DEMOLITION WORK

- A. Listed below are types of demolition work, but not limited to the following:
 - 1. Site Demolition:
 - a. Concrete walks and miscellaneous concrete
 - b. Asphalt paving
 - c. Trees, flower beds and other natural growth as indicated on drawings.
 - d. All other items as shown on the Drawings.
 - 2. Selective demolition to accommodate new architectural, structural, mechanical and electrical work.
 - 3. Remove other miscellaneous items as required for a complete and total demolition job.
 - 4. Remove all materials from owner's property and dispose of materials complying with all Federal, State, and Local Laws and Ordinances.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.05 OWNER'S PROPERTY AND FURNISHINGS

- A. It will be the responsibility of the Contractor to protect Owner's property. Any damage to Owner's property shall be repaired, or if irreparable, replaced at no cost to the Owner.

1.06 JOB CONDITION

- A. Condition of Structure: Owner assumes no responsibility for actual condition of item or structures to be removed.
- B. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

- C. Protection: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to demolition work.
 - 1. Provide protective measures as required by authorities having jurisdiction.
 - 2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of any element of structure.
 - 3. The Contractor shall conduct demolition to minimize interference with adjacent structures.
 - 4. The Contractor shall provide, erect, and maintain temporary barriers and security devices.

1.07 DAMAGES

- A. Promptly repair damages caused to adjacent surfaces and facilities removal work at no cost to Owner.

1.08 TRAFFIC

- A. Conduct demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, or other adjacent occupied/used facilities.
- B. Do not close, block, or otherwise obstruct streets, walks or other occupied or used facilities without Owner's written consent.

1.09 UTILITY SERVICES

- A. The Contractor shall protect all utilities to remain and shall disconnect all utilities to be removed before commencing any other work under this section. The Contractor shall coordinate protection and disconnection of utilities with the appropriate Utility Company or Municipality, and/or the utility owner. Special care shall be exercised in disconnecting any utilities which might cause damage or harm to persons or property. Phone and Data communication shall be maintained to campus at all times.
- B. Do not interrupt existing utilities serving occupied facilities, except when authorized in writing by Owner and/or authorities having jurisdiction. Provide temporary services during interruption to existing utilities as acceptable to governing authorities.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Provide, erect, and maintain temporary barriers and security devices.
 - 3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 5. Do not close or obstruct roadways or sidewalks without permit.
 - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.

3. Stop work immediately if adjacent structures appear to be in danger.

3.02 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 1. Verify that construction and utility arrangements are as indicated.
 2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
 1. Remove items indicated on drawings.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- D. Protect existing work to remain.
 1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch as specified for patching new work.

3.03 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 41 26 – SELECTIVE ELECTRICAL DEMOLITION

PART 1 GENERAL

1.1 DOCUMENTATION OF EXISTING CONDITIONS:

- A. Before new work begins, the Contractor shall determine and document in writing to the Contracting Officer the condition of existing electrical work and auxiliary systems remaining in service. After new work begins, existing electrical work or systems found to be inoperative or defective and not documented shall be repaired or replaced by Contractor at no additional cost to the Government.

1.2 DEMOLITION OF EXISTING ELECTRICAL SYSTEMS:

- A. Demolish existing electrical work, including auxiliary systems, in areas of existing building shown reworked. Coordinate removal of electrical systems with General Contractor and Government.
- B. In reworked areas, remove all electrical equipment; i.e.: Light fixtures, panelboards, switches, receptacles, auxiliary system devices, telephone outlets, etc.; unless otherwise noted. Remove existing branch circuits (conduit, wire, outlet boxes) serving equipment to be removed. Abandon circuits concealed in concrete. Remove conductors from abandoned conduits. Leave existing branch circuits and feeders which run through reworked areas and serve existing equipment to remain in service, continuous and uninterrupted. Repair, re-terminate, re-support, etc., any damaged circuits.
- C. Abandon outlets in existing masonry walls: Remove plaster frames, fill outlet box with grout and patch finish to match existing wall. Cut off conduits at wall where stubbed-out in furred ceiling space.
- D. Cut off conduits concealed in slab two inches below top of base floor slab and patch slab or floor to match existing.
- E. Remove all abandoned communication cabling.

1.3 CUTTING AND REPAIRING:

- A. General Contractor shall do all cutting and repairing of walls, floors, roof, etc., required for installation of work installed in this Division but shall back charge the Electrical Contractor for this work. Advise General Contractor of amount and nature of cutting and repairing necessary to install work prior to bid date.
- B. Do not pierce exterior walls below grade with hanger bolts. Do not cut building structural members except as approved by Contracting Officer. Contracting Officer must approve cutting methods.
- C. Repair work comparable with work cut. New finishes shall match adjacent finishes. Contracting Officer will approve repaired work and may reject unsuitable work.

1.4 CONTINUITY OF SERVICE:

- A. Provide continuous, uninterrupted electrical service to existing outlets, apparatus, and equipment in existing building. Provide temporary wiring installed in safe, approved manner to equipment and outlets as required. Where service interruptions are required, obtain approval for interruption in writing from Government 10 days prior to interruption. Include schedule of work to be performed and time required to accomplish work in request for interruption. Work during service interruptions may occur after normal working hours. Include premium (overtime) time labor in bid.

1.5 SALVAGE:

- A. Electrical equipment, wiring, etc., removed and not required to be part of new electrical installation is classified as salvage.
- B. Salvageable equipment remains property of Government. This Contractor shall sort salvage into recycle bins provided on site by Government. All items that the Government does not retain shall be deemed “rubbish” and removed from the site by the Contractor.

END OF SECTION 02 41 26

**SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES**

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1-02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 03 30 00 - Cast-In-Place Concrete.

1-03 RELATED SECTIONS

- A. Section 03 20 00 - Concrete Reinforcing.
- B. Section 03 30 00 - Cast-in-Place Concrete.

1-04 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ACI 347 - Recommended Practice For Concrete Formwork.
- D. PS 1 - Construction and Industrial Plywood.

1-05 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.

1-06 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347.
- B. Maintain one copy of document on site.

1-07 QUALIFICATIONS

-
- A. Design formwork under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Mississippi.

1-08 REGULATORY REQUIREMENTS

- A. Conform to International Building Code for design, fabrication, erection and removal of formwork.

1-09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.

1-10 COORDINATION

- A. Coordinate this Section with other Sections of work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

PART 2 PRODUCTS

2-01 WOOD FORM MATERIALS

- A. Softwood Plywood: PS 1, B Grade, Group 1, Exterior.
- B. Softwood Plywood: PS 1, HDO, Group I Exterior.
- C. Lumber: No. 2 grade; with grade stamp clearly visible.

2-02 PREFABRICATED FORMS

- A. Preformed Steel Forms: Tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces. Special care shall be used at areas of exposed concrete.

2-03 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, adjustable length, free of defects that could leave holes larger than 1/2 inch in concrete surface.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Corners: Chamfer type; 3/4 x 3/4 inch.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

2-04 CARDBOARD VOIDS AND RETAINERS

- A. Cardboard voids shall be by Savway Carton Forms, Inc. or approved equal. Forms shall be impregnated with parafin and laminated with moisture resistant adhesive. Size as shown on drawings. Forms shall be designed to carry 1,000 pounds per square foot.
- B. Plastic retainers shall be by Savway Carton Forms, Inc. or approved equal.

PART 3 EXECUTION

3-01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3-02 EARTH FORMS

- A. Earth forms are permitted for spread footings, interior grade beams and the interior face of perimeter grade beams. The exterior face of perimeter grade beams shall be formed.

3-03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Formwork ties for grade beams with exposed exterior shall be uniformly spaced horizontally and vertically.
- F. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- G. Provide chamfer strips on external corners of beams, columns and walls.

3-04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

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- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3-05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3-06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3-07 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3-08 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 6 times for concrete surfaces to be exposed to view.

3-09 FORM REMOVAL

-
- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
 - B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
 - C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3-10 SCHEDULE

- A. Grade B plywood for areas not exposed.
- B. HDO plywood for Grade Beams and wall to be exposed.
- C. Steel column forms for exposed concrete columns.

END OF SECTION

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**SECTION 03 20 00
CONCRETE REINFORCING**

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Reinforcing steel bars and accessories for cast-in-place concrete.

1-02 RELATED SECTIONS

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 01 45 33 - Code-Required Special Inspections.

1-03 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ACI SP-66 - American Concrete Institute - Detailing Manual.
- D. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- E. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
- F. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- G. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- H. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- I. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
- J. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1-04 SUBMITTALS

- A. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1-05 QUALITY ASSURANCE

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- A. Contractor Quality Assurance:
1. Perform Work in accordance with CRSI 63, 65 and Manual of Practice, ACI 301, ACI SP-66, and ACI 318.
 2. Maintain one copy of each document on site.
 3. Submit certified copies of mill test report of reinforcement materials analysis.

1-06 STRUCTURAL SPECIAL INSPECTION AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following inspections and tests:
1. Inspection of reinforcing steel for size, spacing, location and support.
 2. Inspection of proper reinforcing steel concrete coverage.
 3. Submit certified copies of mill test report of reinforcement materials analysis.
 4. Welder's Certificates: If approved by the Engineer of Record, submit Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1-07 QUALIFICATIONS

- A. Welders' Certificates: Submit Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1-08 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2-01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.
- B. Fiber Reinforcement: Similar and equal to Fibermesh InForce as manufactured by Synthetic Industries. Application rate shall be 1.5 pounds per cubic yard. Provide where shown on drawings.

2-02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2-03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with ACI 318.

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- B. When approved by Engineer of Record, weld reinforcement in accordance with ANSI/AWS D1.4 and ANSI/AWS D12.1.
 - C. Locate reinforcing splices not indicated on drawings, at point of minimum stress.

PART 3 EXECUTION

3-01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings. Do not cut bars.
- D. Maintain concrete cover around reinforcing as per ACI 318.

END OF SECTION

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**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Cast-in-place concrete building members, floors, foundation walls, grade beams, footings, and etc.
- B. Floors and slabs on grade.
- C. Control, expansion and contraction joint devices associated with concrete work, including joint sealants.
- D. Site concrete.

1-02 RELATED SECTIONS

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 01 45 33 - Code-Required Special Inspections.

1-03 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 302 - Guide for Concrete Floor and Slab Construction.
- C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- D. ACI 305R - Hot Weather Concreting.
- E. ACI 306R - Cold Weather Concreting.
- F. ACI 308 - Standard Practice for Curing Concrete.
- G. ACI 318 - Building Code Requirements for Reinforced Concrete.
- H. ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.
- I. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- J. ASTM C33 - Concrete Aggregates.
- K. ASTM C94 - Ready-Mixed Concrete.

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- L. ASTM C150 - Portland Cement.
 - M. ASTM C260 - Air Entraining Admixtures for Concrete.
 - N. ASTM C494 - Chemicals Admixtures for Concrete.
 - O. ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.04 SUBMITTALS

- A. Product Data: Provide data on joint devices, attachment accessories and admixtures.
- B. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1-05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of embedded utilities and components which are concealed from view.

1-06 QUALITY ASSURANCE

- A. Contractor Quality Assurance:
 1. Perform Work in accordance with ACI 301.
 2. Maintain one copy of each document on site.
 3. Acquire cement and aggregate from same source for all work.
 4. Conform to ACI 305R when concreting during hot weather.
 5. Conform to ACI 306R when concreting during cold weather.

1-07 STRUCTURAL SPECIAL INSPECTION AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following tests and inspections. Tests shall be performed in accordance with ACI 301.
 1. Verify correct design mix is provided.
 2. Perform a slump test as deemed necessary for each load of concrete. Record if water or admixtures are added to the concrete at the jobsite. Perform additional slump tests after job site adjustments.
 3. Mold four specifications per set for compressive testing; one set for each 100 or less cubic yards of each class concrete placed per day. Test one at 7 days, 2 at 28 days, and hold one as a spare to be broken as directed by the Architect/Engineer if compressive strengths do not appear adequate.
 4. For each set of molded specimens record the following:
 - a) Slump
 - b) Temperature, ambient and concrete
 - c) Air content
 - d) Location of placement

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- e) Verification of correct design mix
 - 5. Inspection of concrete placement for proper application techniques.
 - 6. Inspection for maintenance of specified curing temperature and techniques.
- B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.
 - C. Slab on Grade Floor Surface: Test floor flatness and levelness per ASTM E-1155. F_F 25/ F_L 18 minimum overall and F_F 18/ F_L 13 minimum local.

1-08 COORDINATION

- A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
- B. Coordinate all embedded items.

PART 2 PRODUCTS

2-01 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I or Type II.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2-02 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494 Type F - Water Reducing, High Range added at job site after slump tests have been performed.
- C. Fly Ash: ASTM C618.

2-03 ACCESSORIES

- A. Vapor Retarder: Refer to other sections.
- B. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 5,000 psi in 28 days.

2-04 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt.

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- B. Sealant for Pavements, Sidewalks, Curb and Gutter: Silicone joint sealant Dow Corning 888 or approved equal.

2-05 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 2.
- B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1 or Method 2. Submit proposed mix design to Architect/Engineer in accordance with ACI 301.
- C. Provide concrete to the following criteria:
 - 1. Compressive strength: As noted on drawings or other specification sections.
 - 2. Slump: 3 to 5 inches.
 - 3. Water/Cement Ratio shall be .5 or below for all concrete.
- D. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.
- E. Do not use calcium chloride.
- F. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.
- G. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 EXECUTION

3-01 EXAMINATION

- A. Verify site conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3-02 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

3-03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 318 and ACI 301.
- B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.

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- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
 - D. Install joint devices in accordance with manufacturer's instructions.
 - E. Construction joints in floor slabs and floor beams shall be located in the middle third of the span.
 - F. Construction joints for grade beams shall be located at one third of the span beyond the support.
 - G. Place concrete continuously between predetermined expansion, control, and construction joints.
 - H. Do not interrupt successive placement; do not permit cold joints to occur.
 - I. Slab on Grade Floor Surface: $F_F 25/F_L 18$ minimum overall and $F_F 18/F_L 13$ minimum local.

3-04 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
- B. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- C. Place concrete floor toppings to required lines and levels.

3-05 CONCRETE FINISHING

- A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.
- B. Finish concrete floor surfaces in accordance with ACI 301.
- C. Wood float surfaces which will receive tile with full bed setting system.
- D. Steel trowel surfaces which will receive carpeting, resilient flooring, or seamless flooring.
- E. Steel trowel surfaces which are scheduled to be exposed.
- F. Pavements and sidewalks - light broom finish.

3-06 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces in accordance with ACI 308.

3-07 PATCHING

- A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
- C. Patch imperfections as directed in accordance with ACI 301.

3-08 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 03 35 11 CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface treatments for concrete floors and slabs.
- B. Liquid densifiers and hardeners.
- C. Polished concrete.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.
- B. Section 03 30 00 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.
- D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

- A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- B. Mock-Up Size: 10 feet (3 m) square.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

- A. Maintain light level equivalent to a minimum 200 W light source at 8 feet (2.5 m) above the floor surface over each 20 foot (6 m) square area of floor being finished.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

- A. Unless otherwise indicated, all concrete floors are to be finished using liquid densifier/hardener.
- B. Liquid Densifier/Hardener:
 - 1. Use at following locations: All areas listed as polished in Finish Schedule.

- C. Polished Finish:
 - 1. Use at following locations: All areas listed as polished in Finish Schedule.

2.02 DENSIFIERS AND HARDENERS

- A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
 - 1. Composition: Sodium silicate.

2.03 POLISHED CONCRETE SYSTEM

- A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
 - 1. Acceptable Systems:
 - a. Ameripolish, Inc; Ameripolish Polished Concrete System: www.ameripolish.com/#sle.
 - b. Euclid Chemical Company; DOUBLE DIAMOND POLISHED CONCRETE FLOOR SYSTEMS: www.euclidchemical.com/#sle.
 - c. PROSOCO, Inc; Consolideck Polished Concrete System: www.prosoco.com/consolideck/#sle.
 - d. W. R. Meadows, Inc; Induroshine and Bellatrix Concrete Enhancer: www.wrmeadows.com/#sle.
 - e. Advanced Floor Products, Inc.; Retro-Plate 99: www.retroplatesystem.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 GENERAL

- A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

- A. Start any of the floor finish applications in presence of manufacturer's technical representative.
- B. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.
- D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.
- E. Concrete must be in place a minimum of 45 days or as directed by the manufacturer before application can begin.
- F. Application is to take place at least 10 days prior to installation of furniture or accessory installation, thus providing a complete, uninhibited concrete slab for application.

- G. Only a certified applicator shall apply product. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
- H. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.

3.04 CONCRETE POLISHING

- A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer to achieve the following gloss level and aggregate exposure.
 - 1. Gloss Level:
 - a. Level 3. Grit 800 and higher. Sheen medium to high. Minimum number of abrasive passes 6. Appearance semi-polished, reflected objects not quite sharp, but identifiable. Gloss 50-60.
 - 2. Aggregate Exposure:
 - a. Class B - approximate surface cut depth 1/16 inch, "fine/salt and pepper".
- B. Protect finished surface as required and as recommended by manufacturer of polishing system.

3.05 WORKMANSHIP AND CLEANING

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

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Brick Veneer.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
- B. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
- C. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
- D. Section 07 13 00 - Sheet Waterproofing
- E. Section 0714 00 - Fluid-Applied Waterproofing
- F. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.
- G. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2011.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- I. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- J. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.
- K. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.
- L. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- M. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

- N. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- O. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.
- P. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- Q. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- R. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- S. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.
- T. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- U. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.
- V. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- W. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2005.
- X. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit ten samples of (each type of brick veneer) units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.
- D. Material Certificates: Furnish certification signed by manufacturer and contractor certifying that each material complies with requirements.
 - 1. Each cement product required for mortar and grout including name of manufacturer, brand and type.
 - 2. Each type of concrete masonry unit.
 - 3. Each type and size of joint reinforcement.
 - 4. Each type and size of anchors, ties and accessories.

- E. Single Source Responsibility for Mortar Materials: Obtain mortar ingredient of uniform quality for all exposed masonry from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- F. Quality of Masonry Units: All masonry units shall be uniform in color, texture and size, with sharp straight corners and without chipped or broken corners. Exposed masonry units with chipped or broken corners or other defects shall be culled and discarded. All such units placed in wall shall be removed and replaced. Concrete blocks shall conform to ASTM C90, TYPE 1. The provisions of ASTM C90 Paragraph 7.3.1 apply with regard to imperfections. The exception being no chip larger than ¼" diameter and no dimensional tolerances larger than 1/16" shall be installed.

1.07 MOCK-UP

- A. Brick Veneer mock-up. The brick mock-up shall be sized 8 feet long by 6 feet high.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Handle and protect all materials so as to protect from staining, damage, deterioration and mixture with foreign materials. Deliver and store concrete masonry units on pallets in original condition until ready for use. Units shall be delivered dry and Contractor shall maintain necessary protection to prevent wetting of delivered units prior to use.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Standard hollow concrete masonry units to comply with ASTM C-90, Grade N, Type I in color "Natural Gray," having a compressive strength of 1900 psi. All block surfaces shall be uniform in texture and color.
 - 2. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
 - 3. Solid Concrete Masonry Units: To comply with ASTM C-145, Grade N, with an average compressive strength of 1800 psi.
 - 4. Special Shapes: Provide non-standard blocks configured for accessory shapes as indicated or otherwise required to include flush end, halves, lintel block, "U" blocks, jamb blocks, and special shapes..
 - 5. Non-Loadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
- B. Bond Beam Construction: All bond beams are to be constructed using 8" deep bond beam units to maintain the typical running bond pattern of the walls unless otherwise noted. Use 8" bond beam block for first 8" of depth and 8" bond beam blocks with knock out bottoms for each additional 8" of depth.

2.02 BRICK UNITS

- A. Manufacturers:
 - 1. Columbus Brick; www.columbusbrick.com
 - 2. Belden Brick; _____: www.beldenbrick.com/#sle.
 - 3. Interstate Brick; 9780 South 5200 West Jordan, UT 84081. (800) 233-8654
 - 4. Substitutions: See section 01 60 00 - Product Requirements.

- B. Facing Brick: ASTM C216, Type to match existing size, color (see below), and texture, Grade SW.
 - 1. Color and texture: Color to be similar to existing (will be painted). Texture to match existing..

2.03 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
- F. Water: Clean and potable.
- G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Type S.
 - 2. Color: Mineral pigments added as required to produce approved color sample.

2.04 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Hohmann & Barnard, Inc: www.h-b.com.
 - 2. WIRE-BOND www.wirebond.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; uncoated.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- E. Single Wythe Joint Reinforcement: Truss type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure. Furnish complete prefabricated corners and tees.
 - 1. Basis of Design: 120 Truss-Mesh by Hohmann & Barnard, Inc.
- F. Strap Anchors at CMU Partition Intersections: Bent steel shapes configured as required for specific situations, 1-1/4 in (32 mm) width, 0.105 in (2.7 mm) thick, lengths as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from masonry face, corrugated for embedment in masonry joint, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Basis of Design: 344 - Rigid Partition Anchor by Hohmann & Barnard, Inc.

- G. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch (4.8 mm) thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in (32 mm).
- H. Control Joint Reinforcement: Bonds masonry walls and restrains lateral movement while allowing expansion and control to preform as designed. Use at control joints 32"o.c. vertical and at perpendicular brick veneer intersections at 16"o.c. vertically.
 - 1. Basis of Design: Slip-Set Stabilizer, hot-dipped galvanized by Hohmann & Barnard, Inc.
- I. Furnish all other masonry ties as indicated on drawings and required for a complete and proper job.

2.05 FLASHINGS

- A. Refer to section 07 13 00 Sheet Waterproofing.

2.06 ACCESSORIES

- A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - B. Cavity Vents:
 - 1. Weep Vents shall be equal to Driwall Weep Vent 25 manufactured from .375 inch polypropelene filaments with UV stabilizers. Weep vents shall be .375" x 2.5" x 3.5". Driwall weep vents manufactured by Keene Buidling Products P.O. Box 241353, Mayfield Heights, OH 44124. 877-514-5336.
 - 2. Type: Preformed aluminum vents with sloping louvers.
 - 3. Color(s): As selected by Architect from manufacturer's full range.
 - 4. Manufacturers:
 - a. Advanced Building Products, Inc; _____: www.advancedbuildingproducts.com/#sle.
 - b. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
 - c. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Verify that every surface and conditon that is required to be sealed with an air and vapor barrier is in place complete and installed per the project requirments to maintain the separation between the exterior and interior. Do not proceed with any masonry work if breaches of integrety exist in the air and vapor barrier.

- E. Verify that there is no conduit, fasteners or other breaches of the air and water barrier exposed or out of place in the cavity space between the environmental barrier and the back of the masonry.
- F. Report any non conforming work of the back up air and vapor barrier to the contractor to be rectified prior to any masonry work being installed.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. Inspect all Pre Faced Units for quality standard requirements.
- D. Lighting: Provide adequate lighting for masonry work.
- E. Concrete masonry units shall never be wetted immediately before and during laying in the wall.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.
 - 1. All masonry shall be protected against freezing for at least forty eight (48) hours. No anti freeze ingredient to be used.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
 - 1. Lay vertically plumb to a horizontal line with vertically aligned head joints.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness 3/8" (+/-1/16" variation in all joints) unless otherwise noted.
- C. Make joints uniform and compress and tool all exposed face joints.
- D. Cut units with power masonry saw where cuts will be exposed in finished work.
- E. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: match existing.
- F. Brick Units:
 - 1. Bond: Running
 - 2. Coursing: As indicated on drawings.
 - 3. Mortar Joints: match existing.

3.05 PLACING AND BONDING

- A. Lay units using the best concrete masonry practices. Install only quality Ground Face Units; reject all defective units. Align units level, plumb, and true with uniform, carefully-tooled joints on the exposed side of the wall. Draw blocks from more than one pallet at a time during installation.
- B. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- C. Joint Treatment:

1. Exposed Block: Make joints uniform according to Coursing requirements, tool and compress joints using professionally recognized tooling device. Tool to avoid all ridges between vertical and horizontal joints.
 2. Concealed Block: Make joints uniform according to Coursing requirements, cut mortar flush with face of block.
 3. Point and fill flush all exterior cavity side masonry joints as work progresses. Do not leave any voids or cracks larger than 1/32" or excess mortar on surface. Architect must inspect and approve surface prior to application of dam proofing or waterproofing.
- D. Make joints uniform and compress and tool all exposed face joints.
- E. Lay hollow masonry units with face shell bedding on head and bed joints.
- F. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- G. Remove excess mortar and mortar smears as work progresses.
- H. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- I. Interlock intersections and external corners, except for units laid in stack bond.
- J. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- K. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- L. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- M. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches (150 mm).
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 24 inches (600 mm) horizontally and 16 inches (400 mm) vertically.

3.08 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

- A. Install horizontal joint reinforcement 8 inches (200 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches (150 mm).

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches (400 mm) on center vertically and 24 inches (600 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

3.10 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Openings to 42 inches (1070 mm): Place two, No. 3 (M9) reinforcing bars 1 inch (25 mm) from bottom web.
 - 2. Openings from 42 inches (1070 mm) to 78 inches (1980 mm): Place two, No. 5 (M16) reinforcing bars 1 inch (25 mm) from bottom web.
 - 3. Openings over 78 inches (1980 mm): Reinforce openings as detailed.
 - 4. Do not splice reinforcing bars.
 - 5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
 - 6. Place and consolidate grout fill without displacing reinforcing.
 - 7. Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 8 inch (____ mm) bearing on each side of opening.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Do not continue horizontal joint reinforcement through control or expansion joints.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.
- E. Size control joint in accordance with section 07 90 05 for sealant performance.
- F. Form expansion joint as detailed on drawings.

3.12 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch (3 mm).
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

3.14 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Point-up all brick work, fill all holes and joints, remove loose mortar, cut out defective joints and re-point where necessary. Cut sash cord weeps flush with joint face.
- C. Any smears and daubs left on standard non exposed concrete masonry wall surface shall be cleaned by scraping or wire brushing.
- D. Thoroughly clean all masonry. Use only commercially prepared and approved cleaning agents applied in accordance with masonry and cleaner manufacturer instructions. Before applying any cleaning agent to an entire wall, apply agent to a sample wall area in a location approved by the Architect.
 - 1. Basis of Design for Standard concrete masonry: "Sure Klean – Custom Masonry Cleaner" as manufactured by PROSCO, Inc. or equal. This is an acidic cleaner that etches the surface of the masonry wall. Do not use on Ground Face Block Walls. Dilution: 2 parts concentrate; 6 parts water.
- E. Replace defective mortar. Match adjacent work.
- F. Clean soiled surfaces with cleaning solution.
- G. Use non-metallic tools in cleaning operations.

3.16 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

**SECTION 05 12 00
STRUCTURAL STEEL FRAMING**

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Structural steel, embedded items, and miscellaneous steel.
- B. Fabrication shop coat painting.
- C. Steel erection.

1-02 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 09 90 00 - Painting and Coating.
- C. Section 01 45 33 - Code-Required Special Inspections.

1-03 REFERENCES

- A. ASTM A36 - Structural Steel.
- B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- D. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- F. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- G. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- H. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- I. ASTM A992 - Structural Steel, Grade 50.
- J. AWS A2.0 - Standard Welding Symbols.
- K. AWS D1.1 - Structural Welding Code.
- L. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

M. SSPC - Steel Structures Painting Council.

1-04 SUBMITTALS

A. Shop Drawings:

1. Indicate sizes, spacing, and locations of structural members.
2. Connections.
3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.

B. Mill Test Reports: Submit indicating structural strength.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1-05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Provide ultrasonic testing reports for all complete penetration shop welds.

B. Maintain one copy of each document on site.

1-06 STRUCTURAL SPECIAL INSPECTIONS AND TESTING

A. Contractor shall coordinate and schedule in a timely manner with the testing laboratory to perform the following tests and inspections:

1. Anchor bolts
 - a) Anchor bolt size, configuration, and embedment shall be verified prior to placement of concrete.
2. Inspect identification markings for compliance.
3. Review Manufacturer's Certificate of Compliance.
4. Review certified mill test reports.
5. Bolted connections
 - a) Inspection and testing shall be in accordance with AISC specifications for Structural Joints using ASTM A325 or A490 Bolts.
 - b) Provide periodic inspection of all bearing type bolted connections and continuous inspection of slip critical connections. Slip critical connections, if any, will be specifically noted on drawings.
6. Field welded connections
 - a) Inspection shall be in accordance with AWS Structural Welding Code.
 - b) Visually inspect all field welded connections. Provide continuous inspection for complete and partial penetration groove welds; multi-pass fillet welds; single-pass fillet welds greater than 5/16". Provide periodic inspection for fillet welds equal to or less than 5/16"; and joist, floor and deck welds.
 - c) Provide ultrasonic inspection of all complete penetration welds.
 - d) Verify welder qualifications.
 - e) Review weld filler material markings for compliance.

- f) Review Manufacturer’s Certificate of Compliance.
- 7. Inspection of steel frame joint details for compliance with approved construction documents.
 - a) Details
 - b) Member location
 - c) Joint details at each joint

PART 2 PRODUCTS

2-01 MATERIALS

- A. Structural Steel Members:
 - 1. W Shapes: ASTM A992 (Grade 50).
 - 2. Angles, Channels, Plates: ASTM A36.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Pipe: ASTM A53, Grade B.
- D. Shear Stud Connectors: ASTM A108 forged steel, headed.
- E. Bolts, Nuts, and Washers: ASTM A325; galvanized to ASTM A123 for galvanized members.
- F. Anchor Bolts: ASTM A307.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 5000 psi at 28 days.
- I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic.

2-02 FABRICATION

- A. Provide shop workmanship equal to the best modern practice conforming to listed industry standard and in accordance with the latest requirements of the American Institute of Steel Construction.

2-03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP 2.
- B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, and high strength bolted connections.

- C. Galvanize to ASTM A123, structural steel members indicated on drawings. Provide minimum 1.25 oz/sq.ft.

PART 3 EXECUTION

3-01 EXAMINATION

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

3-02 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings or shop drawings.
- C. All exposed welds shall be ground smooth.
- D. Do not field cut or alter structural members without approval of Engineer.
- E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3-03 ERECTION TOLERANCES

- A. All erection of steel, bracing and etc. should be as required by AISC.

END OF SECTION

**SECTION 05 21 00
STEEL JOIST FRAMING**

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Open web steel joists, with bridging, attached seats, and anchors.

1-02 RELATED SECTIONS

- A. Section 05 12 00 - Structural Steel Framing.
- B. Section 05 31 00 - Steel Decking.
- C. Section 09 90 00 - Painting and Coating.

1-03 REFERENCES

- A. ASTM A307 - Carbon Steel Threaded Standard Fasteners.
- B. AWS D1.1 - Structural Welding Code.
- C. FS TT-P-636 - Primer Coating, Alkyd, Wood and Ferrous Metal.
- D. SJI - Standard Specifications for Open Web Steel Joists, K Series.
- E. SSPC - Steel Structures Painting Council.

1-04 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
 - 2. Bridging, connections.
 - 3. Cambers.
- B. Welder's Certificates: Submit manufacturer's certificates that welders employed on the Work have met AWS verification within the previous 12 months.

1-05 QUALITY ASSURANCE

- A. Perform Work in accordance with SJI Standard Specifications, Load Tables, and Weight Tables.
- B. Maintain one copy of each document on site.

1-06 STRUCTURAL SPECIAL INSPECTIONS AND TESTING

- A. Contractor shall coordinate and schedule in a timely manner with the Testing Laboratory to perform the following tests and inspections:
 - 1) Inspection of all welds or bolts of steel joist to other steel members.

1-07 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products to SJI requirements.
- B. Protect joists from distortion or damage.

PART 2 PRODUCTS

2-01 MATERIALS

- A. Open Web Joists Members: SJI Type K open web.
- B. Nuts and Washers: ASTM A307.
- C. Primer: FS TT-P-636.
- D. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36.
- E. Welding Materials: AWS D1.1; type required for materials being welded.

2-02 FABRICATION

- A. Provide bottom and top chord extensions as indicated.

2-03 FINISH

- A. Shop prime joists. Do not prime surfaces that will be field welded.

PART 3 EXECUTION

3-01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3-02 ERECTION

- A. Erect and bear joists on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.
- C. Coordinate placement of anchors in masonry.

- D. After joist alignment and installation of framing, field weld joist seat to bearing plates.
- E. Position and field weld joist chord extensions and wall attachments after dead load is applied.
- F. Do not permit erection of decking until joists are braced, bridged, and secured.
- G. Do not field cut or alter structural members without approval of joist fabricator.
- H. After erection, prime welds, abrasions, and surfaces not shop primed.

3-03 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/2 inch.

END OF SECTION

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**SECTION 05 31 00
STEEL DECKING**

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Steel deck and accessories.

1-02 RELATED SECTIONS

- A. Section 05 12 00 - Structural Steel Framing.

1-03 REFERENCES

- A. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM 36 - Structural Steel.
- C. ASTM A466 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- D. ASTM A525 - Steel Sheet, Zinc-Coated, Galvanized by the Hot Dip Process.
- E. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.
- F. AWS D1.1 - Structural Welding Code.
- G. SDI - Design Manual for Composite Decks, Form Decks, Roof Decks.

1-04 PERFORMANCE REQUIREMENTS

- A. Design metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks.

1-05 SUBMITTALS

- A. Shop Drawings: Indicate decking plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.
- B. Product Data: Provide deck profile characteristics and dimensions, structural properties and finishes.
- C. Manufacturer's Installation Instructions: Indicate specific installation sequence.

1-06 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products from damage.

- B. Cut plastic wrap to encourage ventilation.
- C. Separate sheets and store decking on dry wood sleepers; slope for positive drainage.

1-07 STRUCTURAL SPECIAL INSPECTIONS AND TESTING

- A. Inspection of all welds and/or other attachment to steel members.

PART 2 PRODUCTS

2-01 MATERIALS

- A. Sheet Steel: ASTM A446, Grade A Structural Quality; with G90 galvanized coating conforming to ASTM A525.
- B. Bearing Plates: ASTM A36 steel.
- C. Welding Materials: AWS D1.1.
- D. Touch-Up Primer: Zinc chromate type.

2-02 FABRICATION

- A. Metal Decking: Sheet steel, configured as follows:

Span Design:	Multiple
Minimum Metal Thickness (Excluding Finish):	as shown on drawings
Nominal Height:	as shown on drawings

- B. Metal Closure Strips, Cover Plates, and Related Accessories: 20 gage galvanized sheet steel; of profile and size as required.
- C. Fasteners: Galvanized hardened steel, steel-tapping.
- D. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter.

PART 3 EXECUTION

3-01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

3-02 INSTALLATION

- A. Erect metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks.
- B. Bear decking on steel supports with 1-1/2 inch minimum bearing. Align and level.
- C. Fasten deck to steel support members per drawings.
- D. Weld in accordance with AWS D1.1.
- E. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.
- F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. All cold-formed metal framing used as structural support for exterior cladding and/or used as loadbearing support for any floor or roof areas as shown on the drawings.
- B. Types of cold-formed metal framing units include the following:
 - 1. Exterior non-load bearing stud framing supporting cladding.
 - 2. Interior load-bearing stud framing.
 - 3. Exterior load-bearing stud framing.
 - 4. Floor joist framing.
 - 5. Ceiling or soffit framing.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking and miscellaneous framing.
- C. Section 06 10 00 - Rough Carpentry: Roof and wall sheathing.
- D. Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.
- E. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified.
 - 1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; current edition.
 - 2. ANSI A208.1 - American National Standard for Particleboard; current edition.
 - 3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; current edition.
 - 4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.
 - 5. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; current edition.
 - 6. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; current edition.
 - 7. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members; current edition.
 - 8. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; current edition.
 - 9. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; current edition.
 - 10. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); current edition.

11. FM (AG) - FM Approval Guide; current edition.
12. AWS D1.1, "Structural Welding Code – Steel; current edition.
13. AWS D1.3, "Structural Welding Code - Sheet Steel; current edition.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product information, certification, and installation instructions for each type of cold-formed metal framing and accessory indicated. Include test reports and published allowable loads for all fasteners used.
- B. Shop Drawings: Submit shop drawings for all cold-formed metal framing used to support exterior cladding, floor or roof framing, ceiling or soffit framing and load-bearing support framing for any floor or roof areas. Shop drawings shall indicate placing of all framing members showing type, size, member thickness, number, location and spacing. They shall also indicate supplemental strapping, bracing, splices, bridging, accessories and details required for proper installation. Shop drawings must indicate type of fastening system used along with size and number of fasteners.
 1. Welded connections shall show size and length of welds for all connections.
 2. Screwed connections shall show type, size, and number of screws for all connections. Submit manufacturer's data giving strength values for screws used.
 3. Connections using anchors shall show product name, embedment, edge distance and spacing.
 4. Shop drawings submitted must be prepared under the supervision of and sealed by a professional engineer licensed in the state where the project is located.
- C. Calculations: Submit calculations for all cold-formed metal that are prepared and sealed by a professional engineer licensed in the state where the project is located. Calculations shall indicate sizing of members supporting the loads as indicated on the drawings and the design of connections indicating method of connection and
 1. Size and length of all welds for welded connections.
 2. Type, size, number and capacity of all screwed connections.
- D. Deflection Limits: Design framing to withstand loads without deflections greater than the following:
 1. Brick back-up: $L/600$
 2. Stucco back-up: $L/600$
 3. EIFS back-up: $L/360$
 4. Back-up for flexible materials: $L/240$
- E. Welding certificates.
- F. Qualification data for professional engineer.

1.05 QUALITY ASSURANCE

- A. Professional Engineer Qualification: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this project in material, design and extent.
- B. Product Certification: Manufacturer's material certification or data from an independent testing agency that is qualified according to ASTM E 329 indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness

- C. Fire-Rated Assemblies: 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.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Protect metal framing units from corrosion, deformation, and other damage during delivery storage and handling.
- B. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- C. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.

1.07 MOCK-UP

- A. The work of this section to be part of the Coordinated Envelope Mock-Up. See Section 01 40 00.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing:
 - 1. CEMCO; _____: www.cemcosteel.com/#sle.
 - 2. ClarkDietrich; _____: www.clarkdietrich.com/#sle.
 - 3. MarinoWARE; ____: www.marinoware.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM COMPONENTS

- A. With each type of metal framing indicated on the Architectural or Structural Drawings, provide manufacturer's standard steel studs, joists, rafters, runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners and accessories as recommended by the manufacturer for applications indicated, as needed to provide a complete cold-formed metal framing system.

2.03 GRADES OF STEEL

- A. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade ST33H or ST50H as required by performance or as indicated and coated with G60 galvanized coating.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653, structural steel, zinc coated with G60 galvanized coating and grade as required by structural performance or as indicated.
- C. Minimum Base Metal Thickness: 43 mil for brick back-up, 33 mil for other applications.
- D. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.04 TYPES

- A. Structural Stud/Joist (S-Section): Steel studs of size and thickness as required by structural performance or as indicated, with minimum 1.625" flange and flange return lip.
- B. Track (T-Section): Standard tracks of size, shape, and thickness as required by structural performance or as indicated, with a minimum flange width of 1.25 inches with no return flange lip.

- C. Channel (U-Section): Standard U-section of size, shape, and thickness as required by structural performance or as indicated, with a flange width of 0.500 inches with no return flange lip.
- D. Furring Channel (F-Section): Standard F-section (hat-shaped) of size, shape, and thickness as required by structural performance or as indicated.

2.05 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, 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 or as required for structural performance, 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.

2.06 ANCHORS, CLIPS, AND FASTENERS

- A. Hot-rolled Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Rods: ASTM F 1554, Grade 36, 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, Class C.
- C. Anchoring to Concrete: See Cast-In-Place Concrete Section for acceptable anchoring processes and products.
- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Screws: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
- F. Welding Electrodes: E 60 XX, Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: Galvanizing repair paint shall be "ZRC Cold Galvanizing Compound" as manufactured by ZRC Chemical Products or a paint complying with SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, non-corrosive, non-staining 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. The grout strength shall be

twice the compressive strength of the supporting concrete but need not be greater than 8000 psi nor shall it be less than 5000 psi.

- D. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.
- E. 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.

2.08 FABRICATION

- A. General: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced, reinforced, and stiffened to resist handling, delivery, and erection stresses. Perform lifting of prefabricated panels in a manner to prevent damage or permanent distortion. All load-bearing stud framing must be fabricated into panels and must be compressed to eliminate gaps at ends of studs.
- B. Connections:
 - 1. Type: Fasten cold-formed metal components by any of the following methods or as indicated on the drawings.
 - a. welded
 - b. screwed
 - c. clinch fastening
 - d. riveting
 - e. Wire tying of framing components shall not be permitted
 - 2. Design Forces: Connections of members shall develop the full allowable tensile force of the members connected unless calculations are submitted substantiating lower forces.
 - 3. Design Forces: Connections of members shall develop the forces indicated on the drawings.
 - 4. Welded Connections: Connection of cold-formed metal components may be made using arc welding methods. All welding shall be performed in accordance with the American Welding Society, AWS D1.3. Welding process along with weld sizes and lengths necessary to develop the member forces specified shall be shown on the shop drawings. Protection of the weld area after welding shall be accomplished using a zinc-rich galvanizing repair paint.
 - 5. Screwed Connections: Connection of cold-formed metal components may be made using self-drilling self-tapping screws. Screw type and size along with the number of screws required to resist the member forces specified shall be shown on the shop drawings. Screw penetration into joined members shall be a minimum of three exposed screw threads.
- 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 from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames

- and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.
- B. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
 - C. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
 - D. 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.
 - E. 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.
 - F. 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.

3.02 INSTALLATION

- A. Install cold-formed metal framing systems according to AISI's "Standard for Cold-formed Steel Framing – General Provisions" and to manufacturer's printed or written instructions and recommendations.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or powder-driven fasteners, or 16" o.c. for other types of attachment. Abutting pieces of track shall be securely spliced together. Provide fasteners at corners and ends of tracks.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements. Splices in axially loaded stud systems shall not be permitted. Splices in other work shall not be permitted unless the splice has been engineered and detailed on the shop drawings.
- D. Provide four (4) studs at each intersecting wall and three (3) studs at each corner minimum.
- E. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- F. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- G. Installation of Wall Stud System: Load-bearing studs shall be seated firmly against the track webs with a gap not exceeding 1/8 inch. Connect load-bearing studs to top and bottom runner tracks by either welding or screw fastening as specified at both inside and outside flanges. Install studs at spacing to align directly under joist spacing above but do not exceed 16 inches for load-bearing walls or as shown on the drawings.. Install studs at spacing as shown on the drawings or as required to resist structural loads for non-load-bearing walls,

- H. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support using drift clips, vertical deflection clips, or deflection tracks. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
- I. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.
- J. Horizontal Bridging:
 - 1. Horizontal bridging shall consist of a channel (U-section) attached to each stud using a manufacturer's clip angle. At stud walls 8 inches or deeper, horizontal shall consist of flat strapping screwed to both flanges of stud wall, and to blocking at 8'-0" on center.
 - 2. Install horizontal bridging in all non-loadbearing exterior cladding stud systems, spaced (vertical distance) at not more than 4'-0" o.c.
 - 3. Install horizontal bridging in all loadbearing stud systems spaced (vertical distance) at not more than 4'-0" o.c. Provide positive screwed or welded connection at each stud intersection.
 - 4. Provide stud bracing during construction as required for studs to carry construction loads.
- K. Sheathing Attachment: Provide attachment of interior and exterior sheathing and wall material to each stud in accordance with structural drawings.
- L. Installation of Joists: Install level and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2" end bearing.
 - 1. Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by joist manufacturer and as indicated on the drawings.
 - 2. Where required, reinforce joists at interior supports with single short length of joist section located directly over interior support, snap-on shoe, 30% side-piece lapped reinforcement, or other method recommended by joist manufacturer. Provide web stiffening of joists at points of reaction or concentrated loads when center of web punch-out is less than 12" from edge of bearing.
 - 3. Secure joists to interior support systems to prevent lateral movement of bottom flange.
 - 4. Provide additional joist parallel to each opening that interrupts one or more normal joist spacings unless shown otherwise on the drawings. These openings shall be framed with headers of same size as the typical joist, unless shown otherwise on the drawings.
 - 5. Provide an additional joist under all floor partitions that are parallel to joists and longer than one-half the joist span, unless shown otherwise on the drawings.
 - 6. Bridging:
 - a. Provide bridging as recommended by joist manufacturer top and bottom but not exceeding 8 foot maximum centers for spans exceeding 15 feet and at all concentrated floor loads unless shown otherwise on the drawings. Provide solid bridging between last 4 joists at each line of normal bridging. Provide positive screwed connection at each joist intersection.

- M. Diagonal Bracing: Provide diagonal steel straps of size and location as shown on the drawings. Extend straps from the bottom track to the top track inclined 45° unless shown otherwise and connected with cold-formed metal gusset plates to each track at a stud. Provide connections as required to resist forces indicated on the drawings.
- N. Wall Braces: Provide wall braces ("kickers") as shown on the Architectural and Structural Drawings, but not less in size and gage than that of wall stud being braced and not spaced greater than every fourth stud, and first stud from all corners, whether shown on the drawings or not. Provide connection at each end of brace to develop the required force in the brace. Connections to concrete shall be made with expansion anchors having a valid ICC-ES Evaluation Report by ICC Evaluation Service, Inc. and shall be in strict accordance with manufacturers instructions and only if intended for cold-formed metal attachment. Connections to cold-formed metal and structural steel shall be as specified in section on Connections.
- O. Field Painting: Touch-up shop-applied protective coatings damaged during handling and installation. Use compatible primer for prime coated surfaces; use galvanizing repair paint for galvanized surfaces.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
- B. Miscellaneous Steel Angles, Embeds, Wall Braces, Loose Lintels and other steel and alluminum items that are not structural supports.
- C. Bollards

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.
- D. Section 05 51 00 - Metal Stairs.
- E. Section 05 51 33 - Metal Ladders.
- F. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. Comply with requirements and recommendations of applicable portions of Standard as published by the following:
 - 1. American Institute of Steel Construction (AISC).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. American Welding Society (AWS).
 - 4. Steel Structures Painting Council (SSPC).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

- M. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: For all items in this Section, Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Product information for each product used in this section.
- E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

- A. Welders shall be certified within the previous 12 months as qualified operators according to requirements of the American Welding Society, with copies of certificates furnished to the Architect.

PART 2 PRODUCTS

2.01 ANCHORS

- A. Expansion shields to meet Federal Specification FF-S-325.
- B. Toggle bolts to meet Federal Specification FF-B-588.

2.02 FASTENERS

- A. Screws to meet Federal Specification FF-S-85, FF-S-92, or FF-S-11 as best for intended use.

2.03 WASHERS

- A. Lock washers to meet Federal Specification FF-W-84.
- B. Flat washers as best for intended use.
- C. Flat 3/4" Washers at all Guardrail Panel Fasteners and Bolts.

2.04 ADHESIVE ANCHORS

- A. Hilti Chemical Anchors: Hilti.com
 - 1. Hilti HIT-HY Systems. Size per location and load requirements.

2.05 POWER DRIVEN FASTENERS

- A. Use only when approved in writing by Architect.

2.06 MATERIALS - STEEL

- A. Steel Angles, Channels, Plates: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Loose Lintels: Provide loose structural steel lintels for all openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.

- F. Miscellaneous Framing & Support Items: Provide all miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work. See Drawings.
- G. Stainless Steel Plate:
 - 1. Alloy S304 with mill finish.
 - 2. Thickness, size, and configurations as indicated on drawings.
- H. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- I. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- J. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.07 FABRICATION

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

2.08 FABRICATED ITEMS

- A. Pre-Fabricated Bollards: O.D. as shown on Drawings. Surface Mounted Carbon Steel, Powder Coat Finish, Anchor Plate and Bolts for heavy duty installation.
 - 1. Surface Mounted Security Bollard by TrafficGuard or approved equal.
www.trafficguard.net.
- B. Lintels: As detailed; prime paint finish.
- C. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

2.09 MISCELLANEOUS FRAMING & SUPPORT ITEMS

- A. Provide all miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work. See Drawings.

2.10 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 - 2. Exceptions: Galvanize all exposed exterior steel.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.

- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.11 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

2.12 GYPSUM SURFACE ACCESS PANELS

- A. Gypsum Ceiling or Wall Access Panel: Type KDW Flush access door as manufactured by Karp Associates, Inc. or approved equal. 24"x24" or as required for mechanical access. Provide all required by Mechanical access and drawings.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- D. Coordinate & furnish anchorage's, setting drawings, diagrams, templates, instruction, and directions for installation of anchorage's, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.
- D. Material and workmanship not conforming to the provisions of these specifications shall be rejected any time during the progress of the work. Rejected workmanship or material shall be corrected immediately after notification.
- E. Conceal all fastenings where practicable. Thickness of metal and detail of assembly and supports to give ample strength and stiffness. Form joints exposed to weather to exclude water. Drill weep holes to prevent containment of water in hollow elements.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 FABRICATION

- A. Provide workmanship equal to the best modern practice conforming to industry standards in accordance with latest requirements of American Institute of Steel Construction. All joints to be welded unless bolts are shown on the Drawings. Do all fitting and assembly at work shop and deliver to job ready for erection insofar as possible.

3.05 ERECTION

- A. Erect all work square and plumb, accurately fitted with tight joints and intersections. Adequately reinforce all work and anchor into place.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.

3.06 METALS IN CONTACT

- A. Insulate like metals in contact or in contact with other metals in such a manner as to prevent corrosion. Use materials required for such results approved by Architect.

3.07 MISCELLANEOUS BOLTS, ANCHORS AND FASTENINGS

- A. Securely attach all such work in the most appropriate manner and in accordance with best workmanship as herein specified.

3.08 STEEL LINTELS

- A. Install steel lintels over all openings in masonry where concrete or other lintels are not shown. Provide not less than 8" bearing on masonry at each end. See Structural Drawings for Loose Lintel Schedule.

3.09 MISCELLANEOUS METAL ITEMS

- A. Furnish all miscellaneous items in strict accordance with manufacturer's printed specifications and directions.

3.10 GALVANIZED TOUCH UP REPAIR

- A. Touch up all exterior galvanized steel with Galv-weld regalvanizing bar. Cover scratches, welds, or other flaws in the galvanic surface. Apply in accordance with manufacturer's specifications and directions and as follows:
 1. Clean surface of the heat damaged or abraded galvanized area with a stiff wire brush.
 2. Apply heat (per manufacturer's instructions) to the resurfacing area. The residual heat of an existing weld may be used. No flux is required. Too much heat will cause Galv-weld to gasify or burn; too little heat will cause Galv-weld to not spread properly.
 3. Continue applying heat until the Galv-weld become viscous enough to be spread with a wire brush.
 4. Apply enough Galv-weld to fully cover damaged area.

3.11 TOLERANCES

- A. Maximum Variation From Plumb: 1/8 inch (____ mm) per story, non-cumulative.

- B. Maximum Out of Level 1/16 inch per 10 feet.
- C. Maximum Out of Alignment at running component joint 1/16 inch.
- D. Maximum Offset From True Alignment: 1/8 inch (____ mm).
- E. Maximum Out-of-Position: 1/8 inch (____ mm).

END OF SECTION

SECTION 05 51 00
METAL STAIRS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Stairs with grating treads.
- B. Structural steel stair framing and supports.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 05 52 13 - Guard and Hand Railings: Metal handrails for the stairs specified in this section.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- C. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- E. NAAMM AMP 510 - Metal Stairs Manual; 1992, Fifth Edition.

1.04 SUBMITTALS

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

PART 2 PRODUCTS**2.01 METAL STAIRS - GENERAL**

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Dimensions: As indicated on drawings.
 - 3. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 5. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. Industrial: All joints made neatly.
 - a. Welded Joints: Welded on back side wherever possible.
 - b. Welds Exposed to Touch: Ground smooth.

- c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH GRATING TREADS

- A. Jointing and Finish Quality Level: Industrial, as defined above.
- B. Risers: Closed.
- C. Treads: Steel bar grating.
 - 1. Grating Type: Welded.
 - 2. Bearing Bar Depth: 3/4 inch (19 mm), minimum.
 - 3. Top Surface: Standard.
 - 4. Nosing: Checkered plate.
 - 5. Nosing Width: 1-1/4 inch (32 mm), minimum.
 - 6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.
- D. Stringers: Rolled steel channels.
 - 1. Stringer Depth: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 51 33 METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Alternating Tread Steel Stairs

1.02 RELATED REQUIREMENTS

- A. Section 05 51 00 - Metal Stairs.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.
- C. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 PREFABRICATED LADDERS

- A. Prefabricated Alternating Tread Stair
 1. Performance Requirements:
 - a. Alternating Tread Stair Treads shall be capable of withstanding a single 1000 pound load without permanent deformation.
 - b. Alternating Tread Stair Guard/Handrail shall be capable of withstanding a single concentrated load of 200 pounds or a uniform load of 50 pounds per linear foot applied in any direction at any point on the rail without exceeding the allowable working stress of the material.
 - c. Alternating Tread Stair Stringers shall be capable of withstanding a single concentrated load of 1000 pounds at any point on the stair without permanent deformation.
 2. Dimensions
 - a. Alternating Tread Stair Angle shall be 68 degrees from horizontal.
 - b. Provide Vertical Drop which is the change in elevation, as shown on the drawings, between the upper finished floor surface where the top landing will be attached and the lower finished floor surface where the base of the alternating tread stair will be secured.
 - 1) For Drops 15 feet or more, provide intermediate platform with two stairs of equal heights and sway bracing.
 3. Basis of Design
 - a. Alternating Tread Stair as manufactured by Lapeyre Stair, Inc., 5117 Toler St., Harahan, LA, 70123, LS.SALES@LAPEYRESTAIR.COM, WWW.LAPEYRESTAIR.COM.
 - 1) Material & Finish: Carbon Steel, Factory Applied Powder Coat Finish, Color to be selected by Architect from manufacturer's standard colors.
 - 2) Treads: 13 Gauge
 - 3) Landing & Foot Stampings: 11 Gauge
 - 4) Stringers: U Section designed to meet the performance requirements herein.
 - 5) Handrails: 1 1/2" OD Stainless Steel tubes designed to meet the performance requirements herein.
 - 6) Fasteners: Designed to meet the performance requirements herein.
 - 7) Miscellaneous Materials:
 - (a) Rubber Spine: Hollow neoprene
 - (b) Rubber Foot Divider: Solid Santoprene
 - 8) Fabrication: Fabricate to conform to performance and construction requirements in accordance with approved shop drawings. Fabricate and shop-assemble. Welded connections.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Confirm that the ladder structure to which the ladder safety system is installed is capable of withstanding the loads applied by the system in the event of a fall.

3.02 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Install to meet performance requirements herein.

END OF SECTION

SECTION 05 52 13 GUARD AND HAND RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.

1.02 RELATED REQUIREMENTS

- A. Section 05 51 00 - Metal Stairs: Attachment plates for handrails specified in this section.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- C. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.
- D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.
- E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- G. International Building Code for Guardrails.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data; Submit manufacturers technical data for railing components and accessories.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Elevations; include joint locations, transitions and terminations
 - 2. Glass light fabrication plans with dimensions, holes and finishes
 - 3. Point support layout, details and attachment to support structure.
 - 4. Manufacturers installation and maintenance instructions
 - 5. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 6. Include the design engineer's seal and signature on each sheet of shop drawings.
 - 7. Structural engineers calculations showing point support reactions and glass stresses and verification and seal verifying that the rail design meets all requirements of the IBC and other safety codes required for the condition,

1.05 QUALITY ASSURANCE

- A. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.
- D. Maximum
- E. Allow for expansion and contraction of members and building movement without damage to connections or members.
- F. Dimensions: See drawings for configurations and heights.
- G. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

2.02 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. See Drawings for extents and dimensions of installation.
- D. Anchor railings securely to structure.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/8 inch (____ mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/8 inch (____ mm).
- C. Maximum Out-of-Position: 1/8 inch (____ mm).

3.04 SCHEDULE

END OF SECTION

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-structural dimension lumber framing.
- B. Rough opening framing for doors, windows, and roof openings.
- C. Sheathing.
- D. Subflooring.
- E. Fire retardant treated wood materials.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.
- C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2009).
- C. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010.
- D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.
- E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- G. AWWA U1 - Use Category System: User Specification for Treated Wood; 2012.
- H. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- I. PS 20 - American Softwood Lumber Standard; 2010.
- J. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Concealed lumber in the exterior walls shall all be Fire Retardant rated.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
 - 1. Bond Classification: Exterior.
 - 2. Span Rating: 48.
 - 3. Performance Category: 1-1/8 PERF CAT.
 - 4. Edges: Tongue and groove.
- B. Exterior Wall Sheathing, For Exterior Use: Plywood, PS 1 Grade C-D, Exposure I Fire Retardant.
- C. Wall Sheathing, For Interior Use: Plywood, PS 1, Grade C-D, Exposure I.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

- B. Fire Retardant Treatment:
 - 1. Manufacturers:
 - a. Lonza Group: www.wolmanizedwood.com/#sle.
 - b. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
 - c. Koppers, Inc: www.koppersperformancechemicals.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Exterior Type: AWWA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat all exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.
- C. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with roofing, flashing, or waterproofing.
 - c. Treat lumber in contact with concrete.
 - 2. Preservative Pressure Treatment of Plywood Above Grade: AWWA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In blocking for all exterior walls use only Fire Retardant Treated Wood.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

- E. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches (2440 mm), measured horizontally.
 - 2. All exterior plywood panels shall be Fire Retardant Treated material.
 - 3. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

3.05 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

**SECTION 06 20 00
FINISH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings.
- C. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.
- D. Section 08 14 16 - Flush Wood Doors.
- E. Section 09 90 00 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
 - 2. Provide data on fire retardant treatment materials and application instructions.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.
- B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- C. Protect from moisture damage.
- D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS**2.01 FINISH CARPENTRY ITEMS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.02 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.03 SHOP FINISHING**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 90 00, 09 91 23, and _____.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Hardware.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 06 61 16 - SOLID SURFACE.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- E. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS**2.01 CABINETS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade.
 - 1. Exposed parts shall be 3/4" plywood core or 3/4" MDF core as indicated on the drawings with High Pressure Decorative Laminate on all exposed sides.
 - 2. Semi-exposed parts shall be 3/4" plywood core or 3/4" MDF core where indicated on the drawings with High Pressure Decorative Laminate on all exposed and semi-exposed sides.
 - 3. Concealed parts shall be 3/4" plywood core.
 - 4. High Pressure Decorative Laminate shall be:
 - a. 0.7mm minimum thickness at all other locations.
- C. Cabinets at all locations:
 - 1. Finish - Exposed Exterior Surfaces: High Pressure Decorative laminate.
 - 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 3. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
 - 4. Casework Construction Type: Type A - Frameless.
 - 5. Cabinet Design Series: As indicated on drawings.
 - 6. Adjustable Shelf Loading: 50 lbs. per sq. ft.
 - 7. Cabinet Style: Flush overlay.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL) Type 1: NEMA LD 3, types as recommended for specific applications.
 - 1. Graphite (837-PX) , Plex Finish by the Formica Corporation; [None - N/A]: www.formica.com/#sle.

2.04 COUNTERTOPS

- A. Countertops are specified in Section 06 61 16 - SOLID SURFACE.

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports:

1. Product Knape & Vogt No. 255 and 239.
- C. Drawer and Door Pulls: Stainless Steel..
 1. Product: Model No. SN70/S manufactured by Sugatsune America, Inc. or equal..
- D. Drawer Slides:
 1. Type: Model No. 1300.
 2. Static Load Capacity: Commercial grade.
 3. Mounting: Side mounted.
 4. Stops: Integral type.
 5. Manufacturers:
 - a. Knape & Vogt Manufacturing Company; : www.knapeandvogt.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Hinges: European style concealed self-closing type, CLIP top, steel with polished finish.
 1. Manufacturers:
 - a. Blum, Inc; : www.blum.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (600 mm) from sink cut-outs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 61 16
SOLID SURFACE

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 SECTION INCLUDES:

- A. Solid Surfacing Fabrications for window sills as indicated, including trim and material needed for a complete installation.
- B. Solid surface countertops, fascias, aprons as indicated, including all backsplashes, side splashes, and other components and materials needed for a complete installation.

1.03 RELATED WORK

- A. Related Requirements:
 - 1. Section 12 31 00 - Manufactured Metal Casework.
 - 2. Section 09 21 16 - Gypsum Board Assemblies.

1.04 REFERENCES

- A. REFERENCE STANDARDS: In addition to requirements, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:
 - 1. ISSFA-2, "Classification And Standards Publication of Solid Surfacing Material".
 - 2. ASTM G21 "Fungal Resistance", Method A, no growth.
 - 3. ASTM G22 "Bacterial Resistance", no growth.
 - 4. Stain Resistance, ANSI Z124-6-5.2 1997.

1.05 DESIGN REQUIREMENTS

- A. DESIGN LOAD: Deflection limited to 1/360.
- B. Design items with sufficient strength for handling stresses.
- C. ACCESSIBLE DESIGN: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.06 SUBMITTALS

- A. PRODUCT DATA: Manufacturer's technical literature indicating physical properties and performance criteria for solid surfacing materials and related components.
- B. SAMPLES: Submit two, 2"x 2" samples representative of colors, patterns, textures, finishes and edge treatments. Approved samples will be retained as a standard for the work.
- C. INFORMATIONAL SUBMITTALS:
 - 1. Manufacturer's written installation instructions.
 - 2. Maintenance Data: Manufacturer's recommended cleaning and maintenance procedures. Include in project closeout documents.

1.07 QUALITY ASSURANCE

- A. FABRICATOR/INSTALLER QUALIFICATIONS: Company specializing in fabricating and installing solid surfacing fabrications similar in complexity to those required in this project, including specific requirements indicated.
- B. SOURCE LIMITATIONS: Obtain solid surfacing fabrications through one source.
- C. FIRE-TEST-RESPONSE CHARACTERISTICS: Provide solid surfacing fabrications with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL 723 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.
- D. MOCK-UPS: Build mock-ups to set quality standard for fabrication and installation. Install where directed by Architect. Mock-up may remain as part of this work.
- E. PRE-INSTALLATION CONFERENCE: Conduct conference at Project site to comply with requirements in Section 01 31 00 - Administrative Requirements.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle, and protect materials in accordance with manufacturer's written instructions.
 - 1. Provide protective coverings of suitable material. Take special precautions at corners.

1.09 PROJECT CONDITIONS

- A. ENVIRONMENTAL LIMITATIONS: Do not deliver or install solid surfacing fabrications until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at design levels during the remainder of the construction period.
- B. FIELD MEASUREMENTS: Verify that field measurements are as indicated on Shop Drawings.

1.10 SEQUENCING

- A. A. Sequence work to permit installation of adjacent affected construction.

1.11 WARRANTY

- A. A. WARRANTY: Provide manufacturer's 10 year limited warranty.

PART 2 - PRODUCTS**2.01 MATERIALS AND COMPONENTS**

- A. SOLID SURFACING MATERIALS: Cast, mineral filled, homogeneous, non-porous, decorative surface alloy comprised of 100% acrylic resin complying with ISFA-2.
 - 1. Colors and Patterns: Chosen by architect from manufacturers full range.
 - 2. Thickness: 1/2"
- B. SPECIAL FEATURES: Eased edge treatments.
- C. ACCESSORIES:
 - 1. Adhesives: For seams and drop edges, Solid Surfacing Seaming Cartridges, 9 ounce; color to blend with sheet material.
 - 2. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.02 FABRICATION

- A. Assemble work at shop following manufacturer's printed fabrication instructions and deliver to job ready for installation. Manufacture in largest practical pieces for handling and shipping without seams.
 - 1. Grade: AWI, Custom.
 - 2. Fabricate work square and to required lines.
 - 3. Recess and conceal fasteners, connections, and reinforcing.
 - 4. Design construction and installation details to allow for expansion and contraction of materials. Properly frame material with tight, hairline joints held rigidly in place.
 - 5. Fabricate countertops and vanities with back splash and side splash pieces to profiles and sizes indicated.
 - 6. Fabricate items to profiles shown with connections and supports as indicated or as required for complete installation in accordance with manufacturer's written instructions and approved submittals.
 - 7. Do not exceed manufacturer's recommended unsupported overhang distances.
 - 8. Finish exposed surfaces smooth and polish to low sheen.
 - 9. Radius corners and edges.
 - a. WINDOW SILLS: 1 /2" thick, Solid Surfacing, edge details as indicated.
 - b. TOLERANCES:
 - 1) VARIATION IN COMPONENT SIZE: Plus/Minus 1 /4".

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine surfaces for conditions that would adversely affect execution.
- B. PREPARATION: Take field measurements.

3.02 INSTALLATION

- A. GENERAL: Install in accordance with manufacturer's written installation instructions and approved Submittals. Provide templates and rough-in measurements.
 - 1. Set items plumb, level, rigid and solidly adhered to substrate.
 - 2. Prefit items: Adjust supports to make fit. Align joints over support framing.
 - 3. Apply dabs of silicone on supports; place items on supports and attach.
 - 4. WINDOW SILLS: Install sills tight to window framing and adjacent wall surfaces. Anchor with concealed fastening system to securely prevent rocking, racking, or displacement. Seal joint between sill at adjacent wall and window surfaces with Sealant.
 - 5. COUNTERTOPS, FASCIAS, APRONS, BACKSPASHES, AND SIDESPLASHES: Install per details indicated on Drawings and per manufacturer's instructions.
 - 6. TOLERANCES:
 - a. Maximum Variation From True Dimension: 1 /8".
 - b. Maximum Offset From True Position: 1 /8".

3.03 CLEANING AND PROTECTION

- A. CLEANING:
 - 1. Clean and polish fabrications in accordance with manufacturer's instructions.
 - 2. Promptly remove excessive mastic and seam adhesive.
 - 3. Clean tops and splashes in accordance with manufacturer's recommendations.
- B. Protection:
 - 1. Do not permit construction near unprotected surfaces. Refer to manufacturer's warranty and exclusions.

END OF SECTION

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Replacement of existing roofing system in preparation for entire new roofing system.
- B. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

- A. Section 07 54 23 - Thermoplastic Membrane Roofing.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with affected mechanical and electrical work associated with roof penetrations.
- B. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Attendees:
 - a. Architect.
 - b. Contractor.
 - c. Owner.
- C. Schedule work to coincide with commencement of installation of new roofing system.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
 - 1. When same installer as new roofing system, comply with related requirements of section indicated for new roofing system.

1.05 FIELD CONDITIONS

- A. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.
- B. Maintain continuous temporary protection prior to and during installation of new roofing system.
- C. Owner will not occupy building areas directly below re-roofing area.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Temporary Roofing Protection Materials:
 - 1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

- A. Sweep roof surface clean of loose matter.
- B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

- A. Remove only existing roofing materials that can be replaced with new materials the same day.
- B. Repair existing metal deck surface to provide smooth working surface for new roof system.

3.04 INSTALLATION

- A. Coordinate scope of this work with requirements for installation of new roofing system, refer to Section 07 54 23 for additional requirements.

3.05 PROTECTION

- A. Provide protection of existing roofing system that is not having work performed on it.
- B. Provide protection for all mechanical and electrical equipment and infrastructure. Coordinate roofing removal and replacement with existing mechanical and electrical.

END OF SECTION

SECTION 07 13 00
AIR AND VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fluid-Applied Membrane systems for various applications.
- B. Sheet-Applied Membrane systems for various applications.
- C. Sheet Flashings for various applications.
- D. Underslab vapor retarders.
- E. Below-grade waterproofing systems.
- F. Blindsight waterproofing systems.

1.02 RELATED REQUIREMENTS INCLUDE BUT ARE NOT LIMITED TO

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 07 21 00 - Thermal Insulation: Insulation used for protective cover.
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal parapet, coping, and counterflashing.
- E. Section 07 92 00 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.
- F. Section 22 10 06 - Plumbing Piping Specialties: Roof drain and plumbing vent flashing flanges.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).
- B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- D. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2014.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- F. NRCA (WM) - The NRCA Waterproofing Manual; 2005.
- G. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane, surface conditioner, and flexible flashings.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.

- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 ADMINSTRATIVE REQUIRMENTS

- A. Preinstallation Meeting: Convene at least 10 days prior to the start of any work a meeting to review all the requirments of this Section.

1.06 PERFORMANCE REQUIREMENTS

- A. All of the products described in this section shall perform as a continuous air and vapor barrier around the conditioned spaces of the building and perform as a continuous liquid-water drainage plane flashed to discharge incidental condensation or water penetration to the exterior.
- B. All assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- C. The air barrier/vapor barrier shall have the following characteristics:
 - 1. Continuous, with all joints made airtight.
 - 2. Fluid membrane shall have a dry mil thickness of at least 40 mils (1.02mm).
 - 3. Capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure.
 - 4. Joined in an airtight and flexible manner to the air barrier material of all adjacent systems and components allowing for the relative movement of systems due to thermal and moisture variations and creep.
 - 5. All penetrations of the air barrier and paths of aire infiltration/exfiltration shall be made airtight.

1.07 QUALITY ASSURANCE

- A. Install membrane materials in strict accordance with all safety and either conditions required by the manufacturer or as modified by applicable rules and regulations. Coordinate the installation of materials to achieve the full performance requirements of the enclosure systems.
- B. Install waterproofing and components from one manufacturer to insure a complete tested and warranted system application.
- C. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- D. Contractors Inspection: Upon completion of the air and vapor barrier, the contractor and subcontractor shall inspect every surface and conditon of the air and vapor barrier prior to any work being installed over the barrier. The contractor and subcontractor shall repair any defect and provide a written report verifying the integrety, and completenss of the installation, including the date, attendies, remedies of corrective work. Include photogrpahs, drawings, and additional informpation required to document the full inspection. Notify the architect of any conditon that cannot be remedied to meet the requirments for a full and complete air and vapor barrier.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Contractor shall correct defective Work within a seven year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.
 - 1. Installer shall warrant in writing that air & vapor barrier, flashings and accessories have been installed in accordance with manufacturer's instructions and Specification requirements, and that a full and complete moisture barrier has been achieved.
 - 2. Installer shall provide a seven year full replacement guarantee.
- C. Provide seven year manufacturer warranty for waterproofing failing to resist penetration of water and moisture and vapor, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS**2.01 BASIS OF DESIGN GROUP OF COMPATIBLE SYSTEMS:**

- A. Basis of Design: Various interrelated and compatible systems described herein by GCP Applied Technologies Construction Products; www.gcpat.com. Alternative products must meet all requirements herein.

2.02 AIR BARRIER/VAPOR BARRIER #1 - AB/VB #1 (MEMBRANE AIR BARRIER/VAPOR BARRIER FOR ALL DRAINAGE PLANE SURFACES AT EXTERIOR SHEATHING, MASONRY OR CONCRETE BACK-UP WALLS) -

- A. **AB/VB #1A:** Fluid-Applied Membrane for Walls (#1A or #1B is Contractor's Option):
 - 1. FLUID-APPLIED AIR BARRIER MEMBRANE: Perm-A-Barrier NPL 10, as manufactured by GCP Applied Technologies, 62 Whittemore Avenue, Cambridge, MA; a fluid-applied, vapor impermeable membrane that cures to form a resilient, monolithic, fully bonded elas-tomeric membrane when applied to construction surfaces. The membrane provides supe-rior protection against the damaging effects of air and liquid water ingress on the building structures. Product shall meet the following requirements:
 - a. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa)
 - b. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.
 - c. Water Resistance: ASTM E331: Pass.
 - d. Water Vapor Permeance: ASTM E96, Method A: < 1 perm
 - e. Water Vapor Permeance: ASTM E96, Method B: < 1 perm
 - f. Pull Adhesion: ASTM D4541: minimum 20 psi or substrate failure to glass faced wall board (failure occurs when glass facing pulls away from gypsum core), and minimum 50 psi to concrete/CMU
 - g. Elongation: ASTM D412-Die C: minimum 300%

- h. Low temperature flexibility and crack bridging: ASTM C1305: Pass at minus 15 degrees Fahrenheit (at minus 26 degrees Celsius).
 - i. Nail sealability: ASTM D1970: Pass
 - j. Fire Resistance: Evaluated to NFPA 285 as part of various wall assemblies
- B. **AB/VB #1B:** Sheet-Applied Membrane for Walls (#1A or #1B is Contractor's Option):
- 1. SHEET-APPLIED AIR BARRIER MEMBRANE: Perm-A-Barrier NPS, as manufactured by GCP Applied Technologies, 62 Whittemore Avenue, Cambridge, MA; 0.012 inch adhesive, 0.004 inch HDPE / AL, sheet-applied, vapor impermeable membrane that forms a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. The membrane provides superior protection against the damaging effects of air and liquid water ingress on the building structures. Product shall meet the following requirements:
 - a. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa)
 - b. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.
 - c. Water Resistance: ASTM E331: Pass.
 - d. Water Vapor Permeance: ASTM E96, Method A: < 1 perm
 - e. Water Vapor Permeance: ASTM E96, Method B: < 1 perm
 - f. Elongation: ASTM D412-Die C: minimum 200%
 - g. Low temperature flexibility and crack bridging: ASTM C1305: Pass.
 - h. Nail sealability: ASTM D1970: Pass
 - i. Fire Resistance: Evaluated to NFPA 285 as part of various wall assemblies
- C. **AB/VB #1 ACCESSORIES:**
- 1. TRANSITION MEMBRANE: Perm-A-Barrier Detail Membrane manufactured by GCP Applied Technologies; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
 - a. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/Pa s. sq. m.) maximum
 - b. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.0006 L/s. sq. m (0.00012 cfm/ sq. ft.) maximum
 - c. Puncture Resistance: ASTM E154: 178 N (40 lbs.) minimum
 - d. Lap Adhesion at minus 4 degrees Celsius (25 degrees Fahrenheit): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 - e. Low Temperature Flexibility: ASTM D1970: Unaffected to minus 43 degrees Celsius (minus 45 degrees Fahrenheit)
 - f. Tensile Strength: ASTM D412, Die C Modified: minimum 2.7 MPa (400 psi)
 - g. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: minimum 200%
 - 2. PRIMERS
 - a. Primer for Self-Adhered Transition Membrane and Flexible Membrane Wall Flashing: Perm-A-Barrier WB Primer manufactured by GCP Applied

- Technologies; a water-based primer which imparts an aggressive, high tack finish on the treated substrate.
- 1) Flash Point: No flash to boiling point
 - 2) VOC Content: Not to exceed 10 g/L
 - 3) Application Temperature: minus 4 degrees Celsius (25 degrees Fahrenheit) and above
 - 4) Freezing point (as packaged): minus 7 degrees Celsius (21 degrees Fahrenheit)
- b. Primer for Self-Adhered Transition Membrane and Flexible Membrane Wall Flashing:: Perm-A-Barrier Primer Plus manufactured by GCP Applied Technologies; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
- 1) Color: Milky White (wet), Clear (dry)
 - 2) Weight: 8.25 lbs./gal.
 - 3) Solids Content (by weight): 53-57%
 - 4) Solvent Type: Water
 - 5) VOC Content: Not to excess 1 g/L
 - 6) Application Temperature: 4 degrees Celsius (40 degrees Fahrenheit) and above
3. PENETRATIONS & TERMINATION SEALANT
- a. Liquid Membrane for Details and Terminations and Substrate Patching: Bituthene Liquid Membrane manufactured by GCP Applied Technologies; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L maximum VOC content.
 - b. Sealant for Details, Final Terminations and Sheathing Joint Treatment: Grace S100 Sealant manufactured by GCP Applied Technologies: a one-part, neutral curing, ultra low modulus material designed for use with fluid-applied membranes, self-adhered membrane and tapes. 98 g/L maximum VOC content.

2.03 AIR BARRIER/VAPOR BARRIER #2 (AB/VB #2) (MEMBRANE THRU WALL FLASHING) -

- A. **AB/VB #2:** Product: Perm-A-Barrier® Wall Flashing manufactured by GCP Advanced Technologies Construction Products.
1. Water Vapor Transmission: ASTM E96, Method B – 2.9 ng/m²sPa (0.05 perms) maximum
 2. Water Absorption: ASTM D570 – Max. 0.1% by weight
 3. Puncture Resistance: ASTM E154 – 356 N (80 lbs)
 4. Tear Resistance:
 - a. a. Initiation – ASTM D1004 – min. 58 N (13.0 lbs) M.D.
 - b. b. Propagation – ASTM D1938 – min. 40 N (9.0 lbs) M.D.
 5. Lap Adhesion at -4°C (25°F): ASTM D1876 – 880 N/M (5.0 lbs/in.) of width
 6. Low Temperature Flexibility – ASTM D1970 – Unaffected to -43°C (-45°F)
 7. Tensile Strength: ASTM D412, Die C Modified – Min. 5.5 MPa (800 psi)
 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C – Min. 200%
- B. **AB/VB #2 Accessories:**
1. Primer: Perm-A-Barrier WB Primer, Bituthene Primer WP-3000, Bituthene Primer B2 LVC, or Bituthene Primer B2.
 2. Termination Mastic: Bituthene Mastic.

2.04 AIR BARRIER/VAPOR BARRIER #4 (AB/VB #4) (ROOF/EAVE/VALLEY & BLOCKING - WATERPROOF MEMBRANE) -

- A. **AB/VB #4:** "Grace" Ice and Water Shield or equal, a cold applied self-adhered membrane underlayment, 40 mils thick, comprised of a cross laminated, high density polyethylene film coated on one side with a layer of rubberized asphalt adhesive and interwound with a disposable release sheet.

2.05 VAPOR BARRIER #1 (VB #1) (UNDER SLABS, GRADE BEAMS, FOOTINGS, AT GROUTED MASONRY AT FOUNDATION WALLS, AT SITE WALLS - VAPOR BARRIER)

- A. **VB #1:** Integrally Bonded Vapor Protection: Florprufe® 120 Membrane by GCP Advanced Technologies Construction Products, a 0.5mm (0.021 in) nominal thickness composite sheet membrane comprising 0.4 mm (0.016 in.) of polyolefin film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent vapor migration at the interface of the membrane and structural concrete.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify items that penetrate surfaces to receive waterproofing are securely installed.
- D. Verify that the surfaces that form the air and vapor barrier back up are complete, without voids, are clean and free of debris or foreign matter that would inhibit adhesion, and that there are no interruptions by conduit, fasteners or other items that should not breach the air and vapor barrier, and or flashing.
- E. Verify that all products are chemically and physically compatible prior to the installation of any work.

3.02 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.
- E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.
- F. Prepare building expansion joints at locations as indicated on drawings.
- G. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.
- H. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295/D5295M.
 - 1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
 - 2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.

3. Remove and replace areas of defective concrete as specified in Section 03 30 00.
4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
5. Test concrete surfaces as described in the referenced standards. Verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - AB/VB #1 -

- A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of air & vapor barrier.
- B. Substrate to be smooth and free of voids, spalled areas, loose aggregate and sharp protrusions that would hinder the adhesion or regularity of the air & vapor barrier membrane.
- C. Remove all deleterious materials from surfaces to be covered.
- D. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application.
- E. Install air & vapor barrier to dry surfaces at air and surface temperatures of -4°C (25°F) and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
- F. Air & Vapor Barrier Membrane:
 1. Precut pieces of air & vapor barrier into easily-handled lengths.
 2. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
 3. Apply primer per manufacturers requirements. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate. Lap over Membrane Flashing at shelf angles or brick ledges.
 4. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 5. Overlap horizontally-adjacent pieces 50 mm (2 in.) and roll seams.
 6. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50 mm (2 in.). Roll firmly into place.
 7. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
 8. Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.
 9. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
 10. Coordinate the installation of air & vapor barrier with mason to ensure continuity of membrane and limited UV exposure.
 11. At the end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
 12. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

13. Do not expose air & vapor barrier membrane to sunlight for more than twenty days prior to enclosure.
14. Architect and General Contractor must inspect installation prior to enclosing.
15. The air barrier will be tested in accordance with Section 019115 and the testing matrix.
16. Repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.
17. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture or if it becomes difficult to adhere the air & vapor barrier to the substrate, apply surface conditioner by spray, brush, or roller at the rate recommended by manufacturer, prior to membrane installation. Allow surface conditioner to dry completely before membrane application.
18. Apply a bead or trowel coat of mastic along membrane edges, seams, cuts, and penetrations.

3.04 INSTALLATION - AB/VB #2 -

- A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of flashing. Remove all deleterious materials from surfaces to be flashed.
- B. Install flashing to dry surfaces at air and surface temperatures of -4°C (25°F) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.
- C. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application.
- D. Flexible Wall Flashing: Install flashing in exterior walls above all openings, at all breaks in masonry back-up, at wall base, and all other locations indicated on plans. Through wall flashing/ membrane flashing shall always be sealed or lapped (2") by air & vapor membrane or counter flashed by air & vapor membrane with a minimum of 2" lap.
 1. Precut pieces of flashing to easily handled lengths for each location.
 2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 4. Overlap adjacent pieces (2 in.) and roll all seams with a steel hand roller.
 5. Trim bottom edge (1/4 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
 6. At heads, sills and all flashing terminations turn up ends a minimum of (2 in.) and make careful folds to form an end dam, with the seams sealed. Flashing shall installed 8" minimum wider than opening.
 7. Fold and lap and seal all inside and outside corners. Seal from top to bottom of corner conditions.
 8. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
 9. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.
 10. Architect and General Contractor must inspect installation prior to enclosing.

11. The weep holes and drainage cavity will be tested in accordance with Section 019115 and the testing matrix.
 12. Repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.
- E. Accessories:
1. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply surface conditioner by spray, brush, or roller at the rate recommended by manufacturer, prior to flashing installation. Allow surface conditioner to dry completely before flashing application.
 2. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations.

3.05 INSTALLATION - VB #1

- A. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Remove standing water prior to membrane applications.
- B. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98, including but not limited to, the following:
- C. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
 1. Apply succeeding sheets by overlapping the previous sheet 50-mm (2 in.) along the marked lap line. End Laps should be staggered to avoid a build up of layers.
 - a. Mechanical Fastening Method - To prevent the membrane from moving and gaps opening, the laps should be fastened together at 1.0m (39 in) maximum centers. Fix through the center of the lap area using 12mm (0.5 in) long washer-head self-tapping galvanized screws or similar allowing the head of the screw to bed into the adhesive compound to self-seal. Ensure the membrane lays flat and no openings occur. Additional fastening may be required at corners, details etc.
 - b. OR
 - c. Taped Lap Method - For additional security use Preprufe® Tape to secure and seal the overlaps. Overband the lap with the 100mm (4in) wide Preprufe® Tape using the lap line for alignment. Remove plastic release liner to ensure bond to concrete.
 - d. Mix and apply GCP Advanced Technologies liquid detailing compound to seal around penetrations such as drainage pipes, etc.

3.06 PROTECTION & CLEANING

- A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.
- B. Perm-A-Barrier Liquid is not suitable for permanent exposure and should be protected from the effects of sunlight.
- C. Schedule work to ensure that the Perm-A-Barrier Liquid system is covered as soon as possible after installation. Protect Perm-A-Barrier Liquid system from damage during subsequent operations. If the Perm-A-Barrier Liquid system cannot be covered within 60 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

- D. Clean stains from adjacent surfaces with and remove any foreign matter from finished membrane surface.

3.07 FIELD QUALITY CONTROL

- A. Owner will provide testing services in accordance with Section 01 40 00 - Quality Requirements. Contractor shall provide temporary construction and materials for testing.
- B. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.
- C. Flood to minimum depth of 1 inch (25.4 mm) with clean water, and after 48 hours inspect for leaks.
- D. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.
- E. When area is proven watertight, drain water and remove dam.

3.08 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Batt insulation in exterior wall, ceiling, and roof construction.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.
- C. Section 0713 00 Air and Vapor Barrier: Membrane waterproofing and flashing air and vapor barrier.
- D. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

- A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2015.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- D. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on each product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 QUALITY ASSURANCE

- A. Contractor and subcontractor to inspect the installation of all insulation to verify that all work is complete, installed correctly and that the thermal barrier is established in all locations required prior to covering any part of the work of the is Section with finish or other materials.

1.06 FIELD CONDITIONS

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

PART 2 PRODUCTS**2.01 EXTERIOR BATT INSULATION MATERIALS**

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
4. Formaldehyde Content: Zero.
5. Thickness: 6 inch (___ mm). And other thicknesses to fill voids as shown in the drawings.
6. Facing: Kraft paper faced, one side.
7. Manufacturers:
 - a. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
 - b. Or equal.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SOUND BATT INSULATION

- A. 3-1/2" x 16" and 5-1/2"x16" Sound Attenuation Batt Insulation Unfaced by Owens Corning or equal. Flame Spread 10 (Class A). Locate in Toilet room walls (when studs), above ceilings and as other wise shown in the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

3.02 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation. Completely fill voids as shown in the drawings.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.03 SOUND BATT INSULATION

- A. Install insulation between studs, friction fit between studs, after cover material has been installed on one side of the cavity, use wire or metal straps to hold insulation in place.

3.04 PROTECTION

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

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured metal panels for exterior wall panels and soffit panels, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Wall panel substrate.
- B. Section 06 10 00 - Rough Carpentry: Wall panel substrate.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim.
- D. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- E. AAMA 621 Coil Coated Steel Panels

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
- C. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
- D. Shop Drawings: Show fabrication and installation layouts of metal wall panels or metal soffit panels, details of edge conditions, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
- E. Samples: Submit two samples of wall panel, 12 inch by 12 inch (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.06 MOCK-UP

- A. Locate where directed by Architect.
- B. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.
- C. Stack metal wall panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
- D. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.
- E. Prevent contact with materials that may cause discoloration or staining of products.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finish within specified warranty period.
 - 1. Exposed Panels Finish - deterioration includes 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 a paint to adhere to a bare metal.
 - 2. Warranty Period: 20 Years from the date of substantial completion

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Wall Panels - Concealed Fasteners:
 - 1. Panel Type 1 & 3: Morin Corporation; Concealed Fasteners & Integrity Series: www.morincorp.com/#sle.
 - 2. Perforated Metal Panel: Morin Corporation; Exposed Fasteners.
 - 3. or equal.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Metal Soffit Panels:
 - 1. Morin Corporation; Concealed Series: www.morincorp.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 - 1. Provide exterior panels.
 - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - 3. Design Pressure: In accordance with applicable codes.
 - 4. Maximum Allowable Deflection of Panel: $L/90$ for length(L) of span.
 - 5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 - 6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
- B. Exterior Wall Panels:
 - 1. Profile: Vertical and horizontal, as indicated; style as indicated.
 - a. Wall Panel Type #1 - N-12-0, vertical.
 - b. Wall Panel Type #2 - Panel to match existing.
 - c. Wall Panel Type #3 - W-12, horizontal.
 - 2. Side Seams: Interlocking, sealed.
 - 3. Material: Precoated steel sheet, 20 gage, 0.0359 inch (0.91 mm) minimum thickness.
 - 4. Panel Width: 12 inches (___ mm).
 - 5. Color: As selected by Architect from manufacturer's Premium line.
- C. Exterior Wall Panels (Enclosure Walls inside Warehouse):
 - 1. Profile: Vertical; style as indicated.
 - a. Wall Panel Type #4 - X-12, vertical.
 - 2. Side Seams: Interlocking, sealed.
 - 3. Material: Precoated steel sheet, 22 gage, 0.0299 inch (0.76 mm) minimum thickness.
 - 4. Panel Width: 12 inches (___ mm).
 - 5. Color: As selected by Architect from manufacturer's Premium line.
- D. Exterior Perforated Metal Wall Panels (Screen for Exterior Storage Area)
 - 1. Profile: Vertical; Ribbed Panel, Y-36 Profile.
 - 2. Side Seams: Interlocking, sealed with continuous bead of sealant.
 - 3. Material: Precoated aluminum sheet, 0.050 inches.
 - 4. Panel Width: 36" nominal.
 - 5. Perforation: 1/8" Diameter Holes at 1/4" staggered Centers (23% Open Area).
 - 6. Color: As selected by Architect from manufacturer's Premium Metallic line.
 - 7. Fasteners: As recommended by Manufacturer and finished to match panels.
- E. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- F. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- G. Anchors: Stainless steel.

2.03 MATERIALS

- A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
- B. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface texture; ASTM 755 continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch (0.023 mm); color and gloss to match sample.

2.05 ACCESSORIES

- A. Sealants: As specified in Section 07 90 05.
 - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
- B. Fasteners:
 - 1. Manufacturer's standard type to suit application.
- C. Field Touch-up Paint: As recommended by panel manufacturer.
- D. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
- E. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity

2.06 FABRICATION

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that building framing members are ready to receive panels.
- B. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation.

- C. Verify that water-resistive barrier has been installed over substrate completely and correctly.
- D. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean surfaces to receive copper wall cladding . Substrate to be smooth and free of defects. Drive all projecting nails or other fasteners flush with substrate.

3.03 INSTALLATION

- A. Install panels on walls and soffits in Compliance with manufacturer’s product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.
- B. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
- C. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.
- D. Provide uniform, neat seams.
- E. Fasten panels to structural supports; aligned, level, and plumb.
- F. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.
- G. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

3.04 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch (3.2 mm).

3.05 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.
- C. Repair or replace damage installed products.
- D. Clean installed products in accordance with manufacturer's instruction prior to owner's acceptance.
- E. Remove construction debris from project site and legally dispose of debris.
- F. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Adhered system with thermoplastic polyolefin (TPO) roofing membrane.
- B. Insulation, flat and tapered.
- C. Deck sheathing.
- D. Flashings.
- E. Roofing stack boots and walkway pads.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.
- B. SECTION 01 33 292. SECTION 01 35 16 - Project Sustainability Goal Credit Summary – LEED V4 for PRODUCT COMPLIANCE
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings.
- D. Section 07 71 00 - Roof Specialties: Prefabricated roofing expansion joint flashing.
- E. Section 07 72 00 - Roof Accessories: Roof-mounted units; prefabricated curbs.
- F. Section 22 10 06 - Plumbing Piping Specialties: Roof drains.
- G. Section 26 41 13 - Lightning Protection.

1.03 REFERENCE STANDARDS

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.
- C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2013.
- D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.
- E. FM DS 1-28 - Wind Design; 2007.
- F. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.
- G. NRCA (RM) - The NRCA Roofing Manual; 2017.
- H. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's written information listed below.

1. Product data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- D. Samples for Selection: Submit two samples 24____by__24__ inches (____by____ mm) in size illustrating insulation and colored coating.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- G. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- H. Sustainable Design Submittals:
1. Test report showing solar reflectance index of membrane
 2. Certification documenting recycled content.
 3. Documentation of distance to manufacturing facilities.
 4. Documentation of adhesive and sealant contents.
- I. Specimen Warranty: For approval.
- J. Warranty:
1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.
- K. Manufacturer's Qualification Statement.
- L. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section:
1. With minimum five (5) years documented experience.
 2. Approved by membrane manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Protect products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.
- D. Provide Safety Data Sheets (SDS) at the project site at all times during transportation, storage, and installation of materials.
- E. Comply with requirements from Owner to prevent overloading or disturbance of the structure when loading materials onto the roof.

1.08 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather. Refer to manufacturer's written instructions.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C) or above 90 degrees F (____ degrees C).
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.
- F. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Include accidental punctures according to the manufacturer's standard warranty terms.
 - 4. Include hail damage according to the manufacturer's standard warranty terms.

PART 2 PRODUCTS**2.01 MANUFACTURER**

- A. Carlisle SynTec: www.carlisle-syntec.com/#sle.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFING APPLICATIONS

- A. TPO Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Performance Requirements and Design Criteria:
 - 1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
 - a. Calculate SRI in accordance with ASTM E1980.
 - b. Field applied coating may not be used to achieve specified SRI.
 - 2. Roof Covering External Fire Resistance Classification: Class A when tested per UL 790.
 - 3. Wind Uplift:
 - a. Design Wind Speed: 90 mph (____ km/hr).
 - 4. Insulation Thermal Resistance (R-Value): Provide R-25, minimum, over entire roof deck.
 - 5. Drainage: No standing water within 12 hours after precipitation.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Single Source Responsibility: Provide and install products from single source.
- B. Membrane:
 - 1. Material: Thermoplastic Polyolefin (TPO) complying with ASTM D6878/D6878M.

2. Reinforcing: Internal fabric.
 3. Thickness: 60 mils (0.060 inch) (1.5 mm), minimum.
 4. Sheet Width: Factory fabricated into largest sheets possible.
 5. Color: White.
 6. Product:
 - a. Carlisle Sure-Weld.
- C. Seaming Materials: As recommended by membrane manufacturer.
- D. Flexible Flashing Material: Same material as membrane.
- E. Base Flashing: Provide waterproof, fully adhered base flashing system at all penetrations, plane transitions, and terminations.

2.04 DECK SHEATHING AND COVER BOARDS

- A. Deck Sheathing and Cover Board: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 1/2 inch (13 mm) thick, factory prime painted on one side.
1. Product: GP Dens-Deck, distributed by Carlisle.

2.05 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: ASTM C1289, Type II, Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.
1. Grade and Compressive Strength: Grade 2, 20 psi (Grade 2, 138 kPa), minimum.
 2. Product:
 - a. Carlisle HP-F.

2.06 ACCESSORIES

- A. Prefabricated Flashing Accessories:
1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
 - a. Carlisle Sure-Weld TPO Inside Corners; 60 mils (0.060 inch) (1.5 mm) thick.
 - b. Carlisle Sure-Weld TPO Outside Corners; 60 mils (0.060 inch) (1.5 mm) thick.
 - c. Carlisle Sure-Weld TPO T-Joint Covers; 60 mils (0.060 inch) (1.5 mm) thick, 4-1/2 inch (114 mm) diameter.
 - d. Carlisle TPO Curb Wrap Corners; 45 mils (0.045 inch) (1.1 mm) thick, 6 inch (152 mm) wide flange and 12 inch (305 mm) overall height.
 2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
 - a. Carlisle Sure-Weld TPO Molded Pipe Flashings; for pipes 1 inch to 6 inches (25 mm to 152 mm) in diameter.
 - b. Carlisle Sure-Weld TPO Square Tubing Wraps. 3 inches (76 mm), 4 inches (101 mm), and 6 inches (152 mm) square.
 3. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configuration.
 - a. Carlisle Sure-Weld TPO Molded Sealant Pockets: Two piece, interlocking, flexible pockets with rigid polypropylene vertical wall and preformed deck flanges. 6 inches (152 mm) wide and adjustable from 7-1/2 inches (191 mm) to 12 inches (305 mm) long.
 4. Pressure Sensitive Cover Strips: 6 inch (152 mm) wide, 45 mils (0.045 inch) (1.1 mm) thick, non-reinforced TPO membrane laminated to 35 mils (0.035 inch) (0.9 mm) thick cured synthetic rubber with pressure sensitive adhesive.

5. Walkway Rolls: Sure-Flex Heat Weldable Walkway Rolls; 80 mils (0.080 inch) (2 mm) thick; gray membrane.
6. Miscellaneous Flashing: Non-reinforced TPO membrane; 80 mils (0.080 inch) (2 mm) thick, in manufacturer's standard lengths and widths.
- B. Insulation Adhesive: Two component polyurethane, expanding foam .
 1. Carlisle FAST 100.
- C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches (150 mm) wide; self adhering.
- D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
 1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.
- E. Membrane Adhesive: As recommended by membrane manufacturer.
 1. Carlisle Low VOC Bonding Adhesive.
- F. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- G. Sealants: As recommended by membrane manufacturer.
 1. Sure-Weld Cut Edge Sealant.
- H. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.
 1. Product: Carlisle Weathered Membrane Cleaner.
- I. Primer: Manufacturer's recommended product.
 1. Product:
 2. Carlisle Low VOC Primer.
- J. Edgings and Terminations: Manufacturer's standard edge and termination accessories.
 1. Anchor Bar Fascia System:
 - a. SecurEdge 1000.
 2. Carlisle Termination Bar and Universal sealant bed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips and nailing strips parapit framing and sheathing and coping are in place.

3.02 PREPARATION, GENERAL

- A. Clean substrate thoroughly prior to roof application.
- B. Do not begin work until other work that requires foot or equipment traffic on roof is complete.
- C. Apply manufacturer's recommended vapor retarder or temporary roof before roof installation.

3.03 METAL DECK PREPARATION

3.04 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.
- G. When substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.05 INSULATION APPLICATION

- A. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
 - 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- B. Do not install wet, damaged, or warped insulation boards.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inch (152 mm) from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- F. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch (6.3 mm). Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- H. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (450 mm).
- I. Do not apply more insulation than can be completely waterproofed in the same day.

3.06 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches (75 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

- D. Seam Welding:
 - 1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches (51 mm).
 - 2. Cover seams with manufacturer's recommended joint covers.
 - 3. Probe seams once welds have thoroughly cooled. (Approximately 30 minutes.)
 - 4. Repair deficient seams within the same day.
 - 5. Seal cut edges of reinforced membrane after seam probe is complete.
- E. At intersections with vertical surfaces:
 - 1. Fully adhere flexible flashing over membrane and up to termination bar secured into continuous nailer on vertical surface. _____.
 - 2. Secure flashing to nailing strips at 4 inches (100 mm) on center.
 - 3. At coping, extend membrane fully over coping and adhere, and seal all seams to cover all surfaces of blocking and support. Provide continuous seal between membrane and top of precast panel.
- F. Coordinate installation of roof drains and sumps and related flashings. Locate all field splices away from low areas and roof drains. Lap upslope sheet over downslope sheet.
- G. Install walkway pads at areas of concentrated traffic and as shown on Drawings. Space pad joints to permit drainage.
- H. Daily Seal: Install daily seal per manufacturer's instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.08 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State, and Federal regulations.
- C. Remove bituminous markings from finished surfaces.
- D. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- E. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and sheet metal roofing.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.
- B. Section 07 42 13 - Metal Wall Panels.
- C. Section 07 54 00 - Thermoplastic Membrane Roofing.
- D. Section 07 71 00 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.
- E. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.
- F. Drawings and General provisions of Contract, including General and Supplementary Conditions and Division 1.

1.03 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 12" by 12" inch (____by____ mm) in size illustrating metal finish color.
- D. Sample 20 Year Finish Warranty.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Sheet Metal Flashing and Trim Manufacturers:
 - 1. Morin Corporation; www.morincorp.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch (0.61 mm) and 22 gage, (.0270) inch thick base metal, shop pre-coated with PVDF coating.
 - 1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
 - 2. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 3. Color: To match approved sample. Custom color to match aluminum curtain wall anodized champagne. Architect to provide sample to match.
 - 4. Strippable Film: Material shall be protected with a strippable film for protection of finish surface during shipping and fabrication.
 - 5. Sheet Metal shall be fabricated by same manufacturer as metal roofing manufacturer.
- B. Pre Coated Aluminum: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
 - 1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
 - 2. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 3. Color: To match approved sample. Custom color to match aluminum curtain wall anodized champagne. Architect to provide sample to match.
 - 4. Strippable Film: Material shall be protected with a strippable film for protection of finish surface during shipping and fabrication.
 - 5. Sheet Metal shall be fabricated by same manufacturer as metal roofing manufacturer.

2.03 FABRICATION, GENERAL

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Except as otherwise indicated; comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual".
- C. Fabricate cleats of same type sheet metal, minimum 3 inches (____ mm) wide, interlocking with sheet.
- D. Form pieces in longest possible lengths. 10'-0" minimum length unless otherwise noted.
- E. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- F. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- G. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
- H. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- I. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.
- J. Sealed Joints: Form non-expansive but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- K. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- L. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

2.04 FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: When not a pre-fabricated system, fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide joint cover plates.
 - 1. Joint Style: Lap, 4 inches wide
 - 2. Fabricate with scuppers spaced per drawings, of dimensions required with 4-inch- wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
 - 3. Fabricate scuppers from the following material:
 - a. Precoated metal to match fascia, coping or roof: 22 ga., galvanized steel.
- B. Copings: When not a pre-fabricated system, fabricate in minimum 96-inch- long, but not exceeding 10-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, seal, and solder or weld watertight.
 - 1. Joint Style: Butt, with 12-inch- wide concealed backup plate
 - 2. Fabricate copings from the following material:
 - a. Precoated metal to match fascia, coping or roof: 22 ga., galvanized steel.
- C. Counter flashing: Fabricate from the following material:
 - 1. Precoated metal to match fascia, coping or roof: 22 ga., galvanized steel.
- D. Flashing Receivers: Fabricate from the following material:

1. Precoated metal to match fascia, coping or roof: 22 ga., galvanized steel.
- E. Roof-Penetration Flashing: Fabricate from the following material:
 1. Precoated metal to match fascia, coping or roof: 22 ga., galvanized steel.
- F. Drip Edges: Fabricate from the following material:
 1. Stainless Steel: 24 gage.
- G. Base Flashing: Fabricate from the following material:
 1. Precoated metal to match fascia, coping or roof: 22 ga., galvanized steel.

2.05 GUTTER AND DOWNSPOUT FABRICATION, GENERAL

- A. Gutters: SMACNA (ASMM), Rectangular profile.
- B. Downspouts: Profile as indicated.
- C. Gutters and Downspouts: Size indicated.
- D. Accessories: Profiled to suit gutters and downspouts.
 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 2. Gutter Supports: Brackets.
 3. Downspout Supports: Brackets.
- E. Seal metal joints.

2.06 ACCESSORIES

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
 1. Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 2. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 3. Blind Fasteners: High-strength stainless-steel rivets.
- C. Primer: Zinc chromate type.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units.
- E. Conceal fasteners where possible.
- F. Set units true to line and level.
- G. Set units to be permanently watertight and weatherproof.

END OF SECTION

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured roof specialties, including copings.

1.02 RELATED REQUIREMENTS

- A. Section 07 42 13 - Metal Wall Panels
- B. Section 07 54 23 - Thermoplastic Polyolefin Roofing
- C. Section 07 62 00 - Sheet Metal Flashing and Trim
- D. Section 07 72 00 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- C. NRCA (RM) - The NRCA Roofing Manual; 2017.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- E. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
 - 1. Include coordinated complete shop drawings for expansion joints which describes all conditions.
- D. Samples: Submit two coping samples, 16 inch wide by 16 inch high (___ mm wide by ___ mm high), illustrating component shape, finish, and color.
- E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.
- F. Warranty Documentation: Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

- A. Convene preinstallation meeting [1 week] before start of installation of coping system.
 - 1. Require attendance of parties directly affecting Work of this Section, including Contractor, Architect, installer, and manufacturer's representative.
 - 2. Review the Following:
 - a. Materials.
 - b. Examination of roof edge areas.
 - c. Installation.

- d. Cleaning.
 - e. Protection.
 - f. Coordination with other Work, including membrane roofing installation.
- B. Manufacturer's Qualifications: Manufacturer regularly engaged in the manufacturing of coping systems of similar type to that specified for a minimum of 5 years.
- C. Installer's Qualifications:
- 1. Installer regularly engaged in installation of coping systems of similar type to that specified for a minimum of 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
- 1. OMG Roofing Products; PermaSnap Coping: www.omgroofing.com/#sle.
 - a. PermaSnap Premier Coping System.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
- 1. Configuration: Fascia, and edge securement for roof membrane.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Manufacturers:
 - a. OMG Roofing Products; TerminEdge Fascia: www.omgroofing.com/#sle.
- B. Copings: Factory fabricated to sizes required and as shown in drawings; mitered, welded corners; concealed fasteners.
- 1. Configuration: Concealed continuous hold down 20 ga. cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Wall Width: As indicated on drawings.
 - 4. Outside Face Height: As indicated on drawings.
 - 5. Inside Face Height: As indicated on drawings.
 - 6. Material: Formed steel sheet, galvanized, 24 gage, 0.024 inch (0.6 mm) thick, minimum.
 - 7. Manufacturers:
 - a. OMG Roofing Products; PermaSnap Coping: www.omgroofing.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; custom color to match approved sample.

2.04 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
 - 1. Refer to Section 07 72 00 for information on roofings.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Allow for expansion and contraction in coping as shown and at a minimum of 10 ft on center. verify all expansion joints with architect prior to fabrication.
- E. Comply with NRCA (RM) drawing details as noted:
- F. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- G. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

3.03 CLEANING

- A. Clean coping system promptly after installation in accordance with manufacturer's instructions.
- B. Remove clear protective vinyl film.
- C. Do not use harsh cleaning materials or methods that could damage finish.

3.04 PROTECTION

- A. Protect installed coping system to ensure that, except for normal weathering, coping system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Curbs.
- B. Roof penetrations mounting curbs.
- C. Precast Concrete Splash Blocks

1.02 RELATED REQUIREMENTS

- A. Section 05 31 00 - Steel Decking.
- B. Section 07 54 00 - Thermoplastic Membrane Roofing.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.
- D. Section 07 71 00 - Roof Specialties: Other manufactured roof items.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Guarding floor and wall openings and holes; current edition.
- B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 ROOF CURBS**

- A. Manufacturers:
 - 1. The Pate Company; Roof Curbs: www.patecurbs.com/#sle.

2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
 2. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
 3. Sheet Metal Material:
 4. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G60 (Z180) coating designation; 18 gage, 0.048 inch (1.21 mm) thick.
 - a. Finish: Factory primed.
 5. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
 - a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.
 - b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
 - c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
 - d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
 6. Provide layouts and configurations indicated on drawings.
- C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
 1. Provide preservative treated wood nailers along top of curb.
 2. Insulate inside curbs with 1-1/2 inch (38 mm) thick fiberglass insulation.
 3. Height Above Roof Deck: 14 inches (356 mm), minimum.

2.02 PRECAST CONCRETE SPLASH BLOCKS

- A. Formed precast concrete splash blocks at the outlet of all downspouts.
 1. Nominal Size: 12 inches x 24 inches x 3 inches.
 2. Formed to contain water at sides and back and direct water away from building. Smooth bottom surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 84 00 FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
- C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- C. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010 (Reapproved 2015).
- D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- E. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- F. FM (AG) - FM Approval Guide; current edition.
- G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- J. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD) will be considered as constituting an acceptable test report.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - 3. Verification of minimum three years documented experience installing work of this type.
 - 4. Verification of at least five satisfactorily completed projects of comparable size and type.

1.06 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

1.07 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, grade, and UL label where applicable.
- B. Coordinate delivery with scheduled installation date to allow minimum storage time at site.
- C. Store materials in clean, dry, ventilated location. Protect from soiling, abuse, and moisture. Follow manufacturer's instructions.

1.08 GUARANTEE:

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, strain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products; CP25 Fire Barrier Caulk, CS195 Composite Sheet, FS195 Wrap/Strip, RC-1 Restricting Collars, Interam Fire Dam 150 caulk or moldable putty. : www.3m.com/firestop.
 - 2. Hilti, Inc; _____: www.us.hilti.com/#sle.
 - 3. Specified Technologies Inc; SpecSeal Fast Track Fire Stop Spray: www.stifirestop.com/#sle.
 - 4. DOW Corning Fire Stop Systems.
 - 5. Rockwool: Roxul Safe, Fire Safing Insulation: www.rockwool.com
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

- C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Dam Materials: Mineral fiberboard, mineral fiber matting, sheet metal or alumina silicate fire board.
- F. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRE STOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG) or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
 - 2. Fire Ratings: See drawings for required systems and ratings.
- B. Firestopping at Combustible Pipe and Conduit Penetrations, of diameter 4 inches (100 mm) or less: Any material meeting requirements.
 - 1. Gypsum Board Wall: UL Design No. 147,322, F Rating 2 hour.
 - 2. Through Round Opening: UL Design No.: 49,9,138,202,319,321
 - 3. Through Large Opening: UL Design No.: 49,63,93,94,137,233,234,319,321
- C. Firestopping at Non-metallic (Plastic) Pipe or Conduit through Opening: Any material meeting requirements.
 - 1. Other Interior Partitions: UL Design No. 64, F Rating 1 hour.
- D. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Caulk or putty.
 - 1. Gypsum Board Walls: UL Design No. 149, F Rating 1-1/2 hour.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install penetration sealing materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- C. Where floor openings without penetration items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
- D. Protect materials from damage on surfaces subject to traffic.
- E. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- F. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.

- G. Perform, under this section, patching and repairing of fire stopping caused by cutting or penetration by other trades.
- H. Install backing materials to arrest liquid material leakage.

3.04 APPLICATION:

- A. Apply materials in accordance with manufacturer's instructions.
- B. Apply firestopping material in sufficient thickness to achieve rating to uniform density and texture.
- C. Install material at floors, walls, or partition openings which contain penetrating sleeves, piping, ductwork, conduit, and other items requiring firestopping.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.
- B. Clean up spills of liquid components.
- C. Neatly cut and trim materials as required.
- D. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.
- B. Protect finished work.

END OF SECTION

SECTION 07 92 00 JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
- B. Section 07 13 00 - Air and Vapor Barrier: Sealing cracks and joints in waterproofing substrate surfaces using materials specified in this section.
- C. Section 07 84 00 - Firestopping: Firestopping sealants.
- D. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.
- E. Section 08 80 00 - Glazing: Glazing sealants and accessories.
- F. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- G. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.
- H. Section 23 31 00 - HVAC Ducts and Casings: Duct sealants.

1.03 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2015.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).
- E. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

7. Sample product warranty.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 1. Dow Chemical Company; _____: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 2. Tremco Commercial Sealants & Waterproofing; _____: www.tremcosealants.com/#sle.
 3. W.R. Meadows, Inc; _____: www.wrmeadows.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 1. Dow Chemical Company; _____: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 2. Tremco Commercial Sealants & Waterproofing; _____: www.tremcosealants.com/#sle.
 3. W.R. Meadows, Inc; _____: www.wrmeadows.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.

- a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Joints as described on the Drawings.
 - f. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Joints as described on the Drawings.
 - c. Other joints indicated below.
 3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
 3. Sealant shall be Pecora 864 Architectural Silicone Sealant, TT-S-1543A, TT-S230-C, Class A, CGB-19GP-9, ASTM C920M Class 50, Type S, Grade NS, Use G,A,M, O, Primer P-150 as required by Manufacturer. other equal sealant by Sonneborn or Tremco acceptable.
 4. Colors to be selected by Architect.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. One component high-performance polyurethane sealant as manufactured by Sonneborn (NP1) or similar and equal products as manufactured by Pecora or Tremco.
 2. Colors to be selected by Architect.
 3. Joints between door, window, and other frames and adjacent construction.
- D. Interior Wet Areas: Bathrooms; fixtures in wet areas include plumbing fixtures.

2.03 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 2. Open Cell: 40 to 50 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
 - 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 - 5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- K. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- L. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- P. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

- Q. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 2013.
- R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- S. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Manufacturer's Qualification Statement.
- E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 10 years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com.
 - 3. Steelcraft, an Allegion brand; _____: www.allegion.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.

5. Typical Door Face Sheets: Flush. Refer to Door Schedule for additional information.
 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 8. Finish: Factory primed, for field finishing.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - f. U-Value: U-0.61 minimum.
 2. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
 3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
- C. Interior Doors, Non-Fire Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
- D. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Model 2 - Seamless.
 - b. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm), minimum.
 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 3. Provide units listed and labeled by UL (DIR).
 - a. Attach fire rating label to each fire rated unit.
 4. Door Thickness: 1-3/4 inch (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. General:
 - 1. Comply with the requirements of grade specified for corresponding door.
 - 2. Finish: Same as for door.
- C. Frame Finish: Factory primed and field finished.
- D. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
 - 3. Weatherstripping: Separate, see Section 08 71 00.
- E. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch (150 mm), maximum, above floor at 45 degree angle.
 - 2. Frame Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
- F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Transom Bars: Fixed, of profile same as jamb and head.
- I. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (102 mm) high to fill opening without cutting masonry units.

2.05 FINISHES

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

2.06 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
- B. Glazing: As specified in Section 08 80 00.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

2.07 FINISHES

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

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Install door hardware as specified in Section 08 71 00.
- E. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.06 SCHEDULE

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

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 06 20 00 - Finish Carpentry: Wood door frames.
- B. Section 08 12 13 - Hollow Metal Frames.
- C. Section 08 71 00 - Door Hardware.

1.03 REFERENCE STANDARDS

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- B. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- C. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - 2. Provide labels or certificates indicating that installed work will comply with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 3. Provide designated labels on shop drawings as required by certification program.
 - 4. Provide designated labels on installed products as required by certification program.
 - 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

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

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

1.06 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Submit Manufacturer's written warranty (2 years for exterior doors, lifetime for interior doors) covering all solid core wood doors herein specified to the Architect and stating that during the year after installation manufacturer will replace without charge any door which becomes unserviceable/ unfit for use and pay reasonable rehanging and refinishing costs. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction. The Door Manufacturer to inspect doors after installation and note on warranty that no provisions have been voided or nullified after completion of installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Oshkosh Architectural Door Co., "GP" 5 ply Series: www.oshkoshdoor.com
 - 2. Masonite Wood Doors: www.masonite.com/#sle.

2.02 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS) or WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
 - 3. The moisture content of all wood components shall average from 6-9 percent at the time of fabrication and shall be at equilibrium with same relative humidity condition at the time of door fabrication.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Solid core doors shall be particle core, 5 ply construction, 1/16" thick hardwood crossbanding, "GP" series as manufactured by Oshkosh Architectural Door Co., or approved equal, pending compliance with requirements. Face veneer shall be premium grade plain sliced white ash.
 - 3. Wood veneer facing with factory transparent finish.

2.03 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face. Veneer thickness prior to sanding shall be from 1/32 to 1/36. No veneer will be less than 1/50 of an inch thick after factory sanding. Each individual piece of veneer forming the door face will be edge glued together.

2.04 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails: Stiles 1" minimum laminated(after trim) 2 ply hardwood with outer ply being a minimum of 1/2" (matching face veneer).

Rails 1-1/8" minimum hardwood (after trim). Stiles and rails are bonded to the core and then abrasively planed(sanded) prior to the application of the veneer.

1. Provide solid blocks at lock edge for hardware reinforcement.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

2.05 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 1. Transparent:
 - a. System - 1, Lacquer, Nitrocellulose.
 - b. Sheen: Flat.

2.06 ACCESSORIES

- A. Glazing: See Section 08 80 00.
- B. Glazing Stops: Door Manufacturer to furnish Rolled steel channel shape visual frames of size indicated on drawings, mitered corners; prepared for countersink style tamper proof screws. Frame shall comply with label requirement of door.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installer must examine doorframes and verify that frames are of the correct type and have been installed as required for proper hanging of corresponding doors. Installer shall notify the Contractor in writing of conditions detrimental to the proper and timely installation of wood doors; do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Verify existing conditions before starting work.
- C. Verify that opening sizes and tolerances are acceptable.
- D. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging. Install wood doors in accordance with manufacturer's instructions and as shown. Fit doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining. Bevel non fire rated doors 1/8" in 2" at lock and hinge edges. Bevel fire rated doors 1/16" in 2" at lock edge.
- B. Pre-fit Doors: Fit to frames and machine for hardware to whatever extent required for proper fit and uniform clearance at each edge. For non fire doors provide clearances of 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering, except where threshold is shown or scheduled provide 1/4" clearance from bottom of door to top of threshold. For fire rated doors, provide clearances complying with the limitations of the authority having jurisdiction.
- C. Install doors in accordance with manufacturer's instructions and specified quality standard.

- D. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- E. Use machine tools to cut or drill for hardware.
- F. Coordinate installation of doors with installation of frames and hardware.
- G. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Re-hang or replace doors which do not swing or operate freely as directed by Architect. Re-finish and/or replace doors damaged during installation, as directed by the Architect.
- D. Protection of Completed Work: Installer shall advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of the work.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Wall and ceiling access door and frame units.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies - Openings in ceilings.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Manufacturer's Installation Instructions: Indicate installation requirements.
- D. Project Record Documents: Record actual locations of each access unit.

PART 2 PRODUCTS**2.01 ACCESS DOORS AND PANELS ASSEMBLIES**

- A. Wall-Mounted Units:
 - 1. Location: as required to accommodate MEP components that require access for maintenance and operation.
 - 2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 - 4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
 - 5. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- B. Ceiling-Mounted Units:
 - 1. Location: as required to accommodate MEP components that require access for maintenance and operation.
 - 2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
 - 3. Size - Other Ceilings: 12 inch by 12 inch (305 mm by 305 mm).
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Karp Associates, Inc; ____: www.karpinc.com/#sle.
 - 3. Nystrom, Inc; ____: www.nystrom.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Electric operators and control stations.
- B. Overhead coiling doors, operating hardware, non-fire-rated and exterior; electrically operated.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Cylinder cores and keys.
- B. Section 09 90 00 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- B. FBC TAS 203 - Criteria for Testing Products Subject To Cyclic Wind Pressure Loading; Testing Application Standard; 1994.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Verification Samples: Submit two slats, 24 inch (____x____ mm) in size illustrating shape, color and finish texture.
- E. Selection Samples: For each finished product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.09 WARRANTY

- A. Warranty: Manufacturer's limited door and operator system, except the counterbalance spring finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.
- B. PowderGuard Finish:
 - 1. PowderGuard Max: Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Max Finish warranty for 5 years.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Overhead Coiling Doors:
 - 1. Overhead Door Corporation; Model 625: www.overheaddoor.com/#sle
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING DOORS

- A. Overhead Coiling Stormtite Insulated Service Doors: Overhead Door Corporation Model 625.
 - 1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
 - a. Flat profile type F-265i for doors up to 40 feet wide.
 - b. Front and back slats fabricated of 24 gauge galvanized steel
 - c. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation. R-Value: 7.7. U-Value: 0.13. Sound Rating: STC-21.
 - 2. Performance:
 - a. Installed System Sound Rating: Sound Rating: STC-21 as per ASTM E 90.
 - b. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
 - c. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage <1.00 cfm/ft².
 - 3. Slats and Hood Finish:
 - a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
 - 1) Powder Coat: PowderGuard Max powder coat colors to match Architect's color sample.
 - 2) Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
 - 4. Weatherseals: Stormtite perimeter seal system for sides top and bottom.
 - 5. Bottom Bar: Two steel angles minimum thickness 1/8 inch bolted back to back to reinforce curtain in the guides. PowderGuard Premium to match selected slat finish.
 - 6. Guides: Three structural steel angles with powder coated finish to match selected slat finish.

7. Brackets: Galvanized steel to support counterbalance, curtain, and hood.
8. Finish: PowerGuard Max hardened powder coat in custom color to match architect's sample.
9. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
10. Hood: Provide with internal hood baffle weatherseal.
 - a. 24 gauge galvanized steel with intermediate supports as required.
11. Electric Standard Duty Commercial Operator: Direct drive integrated gear/motor/brake assembly; Factory pre-assembled rive assembly and limit sensors; Manual hand chain for power outage. 230V AC 3-phase motor (operating range 208-245V).
 - a. Mounting: Wall.
 - b. Motor: 3/4 HP, totally enclosed non-ventilated.
 - c. Radio receiver.
 - d. Drive Reduction: Primary belt reduction with secondary chain and sprocket.
 - e. Mechanical brake
 - f. Control panel: electronic controller with microprocessor self-diagnostics. Digital readout indicates door action, alarm conditions, and fault conditions. Time delay self-close timer and non-resettable cycle counter is included. Enclosure is IP54 rated (NEMA 3 equivalent).
 - g. Actuator: Single open/close/stop push button station incorporated into control panel.
 - h. Safety sensing and reversal.
12. Windload Design: Standard windload shall be 20 PSF.
13. Locking: Cylinder lock for manual operation.
14. Wall Mounting Condition: Interior face-of-wall mounting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that adjacent construction is suitable for door installation.
- B. Verify that electrical services have been installed and are accessible.
- C. Verify that door opening is plumb, header is level, and dimensions are correct.
- D. Notify Architect of any unacceptable conditions or varying dimensions.
- E. Commencement of installation indicates acceptance of substrate and door opening conditions.
- F. Verify that opening sizes, tolerances and conditions are acceptable.
- G. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- H. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Install enclosure and perimeter trim.

3.03 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.04 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 08 34 58 VAULT DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vault door.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Vault wall construction.
- B. Section 28 46 00 - Fire Detection and Alarm: Connection of automatic door closer to fire alarm system.

1.03 REFERENCE STANDARDS

- A. FS AA-D-600 - Door, Vault, Security; Federal Specification; 2010, Revision D.
- B. FS FF-L-2740 - Locks, Combination; Federal Specification; 1997, Revision A, and Amendment 1.
- C. UL 140 - Standard for Relocking Devices for Safes and Vaults; Underwriters Laboratories; Current Edition, Including All Revisions.
- D. UL 768 - Standard for Combination Locks; Underwriters Laboratories; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets and installation instructions for all major components including locks; include head, jamb, and sill sections; show elevations, clearances, opening dimensions, door size(s), materials, finishes, and construction details.
- C. Shop Drawings: Prepare drawings specifically for this project, showing head, jamb, and sill cross-sections to illustrate dimensional relationship of doors to adjacent construction and floor finishes.
- D. Operation and Maintenance Data: Include instructions for lock and emergency egress mechanism.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver door and frame assemblies to project site in protective covering with manufacturer and product name clearly marked.
- B. Inspect materials for damage upon delivery. Replace damaged materials.
- C. Store door and frame assemblies under cover, in a dry location free from dust and other contaminants, and elevated above grade.

PART 2 PRODUCTS

2.01 VAULT DOORS

- A. Manufacturers:
 - 1. Overly Door Company Model No. C5V-IIL-K: www.overly.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-UL-Listed "GSA" Vault Doors: Assembly consisting of outswinging door, frame, sill, hinges, multi-point bolt mechanism, and locks; entire assembly complying with FS AA-D-600 Class 5-V and fabricated as a standard product of a single manufacturer.

1. Bolt Engagement/Disengagement Force: 15 pounds-force (20 Nm), maximum.
 2. Swing Force at Operating Handle: 33 pounds-force (45 Nm), maximum.
 3. Clear Opening Width - Single Door: 40 inches (1016 mm).
 4. Clear Opening Height: 78 inches (1981 mm).
 5. Door Swing - Single Door: Hinged on left when looking toward vault; outswinging.
- C. Locking Mechanism: Multi-point bolts extended into door frame and retracted by handle on outside face of door, with emergency release mechanism on inside; outside handle locked/unlocked by combination lock.
1. Bolts: At least 5 bolts at each jamb, nickel plated and permanently lubricated.
 2. Bolt Diameter: 11/16 inch (17 mm), minimum.
 3. Combination Lock: Mechanical type complying with UL 768 Class Group 1R.
 - a. Locking Mechanism: 3 tumbler, key change type with metal case, protected by drill-resistive steel plate.
 4. Automatic Relocking Device: UL 140 classified, to automatically deadlock bolts in case of tool or torch attack.
 5. Signage: Permanently mounted, with instructions for operating emergency release; located on the inside face of the door or nearby.
- D. Frame: Wrap-around hollow steel frame not requiring grouting, designed so that when installed the mounting bolts or other attachment mechanism is accessible only from inside the vault; not more than 1/8 inch (3 mm) clearance between door and frame.
1. Steel: Minimum 0.048 inches (1.2 mm) thick.
 2. Jambs and Soffit: Single piece of steel for each length, continuously welded along entire corner intersection.
 3. Frame Depth: To fit wall in which it is installed.
 4. Threshold: Steel, stainless steel, or nickel silver; full width of opening; flat, flush with finished floor or not more than 1/4 inch (6 mm) thick tapered on each side; bolt receptors, if used, must be at least 1/2 inch (12 mm) deep.

2.02 DAY GATES

- A. Day Gate: Swing-in, hinged on same side as vault door; no interference with vault door inner release mechanism; made as part of vault door assembly.
1. Style: Vault door manufacturer's standard.
 2. Frame: Minimum 3/8 inch (9 mm) by 1-1/4 inch (31 mm) members.
 3. Locking: Standard lever handle cylindrical lockset, self-latching, deadlocking; outside handle controlled by key outside, key allows operation of handle without unlocking handle, key may be used to unlock handle; always unlocked from inside.
 4. Finish: To match vault door unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall thickness and rough door opening are constructed correctly and of proper dimensions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction, with door and frame mounted plumb and true, securely attached to vault wall construction.

- B. Adjust operating components for proper function, free and smooth operation, and secure locking; partially opened door should remain in position without manual or artificial stops.

3.03 PROTECTION

- A. Protect products from damage until Date of Substantial Completion.
- B. Repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Door hardware.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 specification sections apply to work of this section.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Manufacturer's recommended installation procedures which, when approved, will become the basis for accepting or rejecting actual installation procedures used on the work.

- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide Ten (10) year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Thermally-Broken:
 - 1. Basis of Design: Kawneer Company, Inc.; 451UT (Ultra Thermal) Framing Systems.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Trulite Glass & Aluminum Solutions, LLC; _____: www.trulite.com/#sle.
 - 2. YKK AP America Inc; _____: www.ykkap.com/#sle.

2.02 BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Insulating Glazing, Thermally-Broken:
 - 1. Basis of Design: Kawneer 500T Insulpour Thermal Entrances.
 - 2. Basis of Design: Tubelite, Inc.; Wide Stile Entrance: www.tubeliteinc.com..
 - 3. Thickness: 1-3/4 inches (43 mm).

2.03 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I natural anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.

- b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 2. Finish Color: Clear Anodized.
 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Performance Requirements:
 1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).
 3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.
 4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
 5. Overall U-value Including Glazing: 0.46 Btu/(hr sq ft deg F) (_____ W/(sq m K)), maximum.

2.04 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 1. Glazing Stops: Flush.
- B. Glazing: As specified in Section 08 80 00.
- C. Swing Doors: Glazed aluminum.
 1. Thickness: 1-3/4 inches (43 mm).
 2. Top Rail: 5 inches (_____ mm) wide.
 3. Vertical Stiles: 5 inches (_____ mm) wide.
 4. Bottom Rail: 10 inches (254 mm) wide.
 5. Glazing Stops: Square.
 6. Finish: Same as storefront.

7. Door stiles and rails shall be accurately joined at corners with heavy concealed reinforcement brackets secured with bolts and screws, and shall be MIG welded. Doors shall have beveled snap-in stops with mitered corners and bulb glazing vinyl on both sides of the glass. No exposed screws shall be permitted. Each door leaf shall be equipped with an adjusting mechanism located in the top rail near the lock stile which provides for minor clearance adjustments after installation. Weathering shall be installed in the hinge stiles of pairs or single center hung doors. The lock stile of a single center hung door, active meeting stile at a pair of butt hung, offset pivot, or center-hung doors shall have an adjustable astragal weather-strip. Door frame and sidelight framing shall be accurately joined at corners with unexposed screws. All glazing shall be flush, including the horizontal muntins and sills. Glass shall be held in place by EPDM glazing gaskets on both sides. No applied stops shall be permitted except at the transom bar of center hung doors. All butt-hung and offset pivot door frames shall have door stops at jambs and head with continuous weathering.
8. All doors shall be equipped with a maximum security hookbolt lock. Pairs of doors shall be equipped with lever type flush bolts in the top and bottom of the inactive meeting stile. Operating hardware shall be center pivots as supplied by the door manufacturer. Closers for center pivoted doors shall be door manufacturer's standard overhead concealed closers, where required. See Hardware Section for finish hardware cylinders for entrance doors.

2.05 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. All door and framing sections shall be extruded aluminum alloy and tempered to meet or exceed finishing and structural criteria as specified. Provide all reinforcing if required. Door Stiles and rails, excluding glass stops, shall be tubular and have .125" wall thickness. All weathering shall be hardbacked silicone treated polypropylene. Any exposed fasteners shall be stainless steel.
- C. Fasteners: Stainless steel.
- D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.06 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.
- B. All exposed surfaces shall be free of unsightly scratches and blemishes. All exposed sections shall have a Class I Anodic Coating conforming with Aluminum Association Standard AAM12C22A42/44. Permanodic Color: # 17 Clear.

2.07 HARDWARE

- A. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- B. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- C. Exterior Thresholds: See Section 08 71 00 - Door Hardware.
- D. Hinges: Continuous hinge geared incorporating lubricated bearings between knuckle, attach 6" o.c. min, Finish: #14 Clear Alum.
- E. Exterior Pulls: CO-12 by Kawneer. One each exit door - mount on exterior.
- F. Exit Devices: Falcon EL-1690-NL-HBOP-36-US28-ES.
- G. Door Closers: Concealed overhead.

- H. Locks: 5 pin mortised; keyed cylinder outside. Provided by hardware Section 08 71 00 subcontractor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Accurately scribe all cut outs, recessing and mortising and reinforce as necessary with backing plates to insure adequate strength of connections.
- C. All openings shall be prepared plumb and square by others and shall be of sufficient size to provide clearance at jambs, head and sill as shown on the drawings.
- D. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- E. Provide alignment attachments and shims to permanently fasten system to building structure.
- F. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- G. Provide thermal isolation where components penetrate or disrupt building insulation.
- H. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- I. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- J. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- K. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- L. Set thresholds in bed of sealant and secure.
- M. Install hardware using templates provided.
- N. Install glass and infill panels in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
- O. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.

- B. Leave labels in place, intact and legible until review and approval by Architect.
- C. Do not at any time remove required AAMA labels.
- D. Prior to completion of the work, thoroughly clean all exposed surfaces of glass.
 - 1. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
 - 2. Do not scratch or otherwise damage the glass or the sash finish.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Upon completion of construction, Contractor shall be responsible for cleaning all aluminum, employing methods recommended by the manufacturer as follows:
 - 1. Anodized aluminum shall be cleaned with plain water containing a mild detergent, or a petroleum product such as white gasoline, kerosene or distillate.
 - 2. No abrasive agent shall be used.

END OF SECTION

SECTION 08 71 00**DOOR HARDWARE****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Section Includes: Finish hardware except as otherwise specified or specifically omitted herein.
- B. Related Sections:
 - 1. Section 08 11 13 – Hollow Metal Doors & Frames.
 - 2. Section 08 14 16 – Flush Wood Doors
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
 - 1. Windows
 - 2. Cabinets of all kinds, including open wall shelving and locks.
 - 3. Signs, except as noted.
 - 4. Toilet accessories of all kinds including grab bars.
 - 5. Installation.
 - 6. Rough hardware.
 - 7. Folding partitions, except cylinders where detailed.
 - 8. Sliding aluminum doors.
 - 9. Corner guards.

1.02 SUBSTITUTIONS & SUBMITTALS:

- D. Requests for substitutions will not be considered until after the contract for construction has been awarded.
- E. SUBMITTALS: Submit six copies of schedule at earliest possible date prior to delivery of hardware. Organize schedule into "Hardware Sets" with an index of doors and heading, indicating complete designations of every item required for each door or opening. Include the following information:
 - 1. Type, style, function, size, quantity and finish of each hardware item.
 - 2. Name, part number and manufacturer of each item.
 - 3. Fastenings and other pertinent information.
 - 4. Location of hardware set cross referenced to indications on drawings both on floor plans and in door schedule.
 - 5. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 6. Mounting locations for hardware.
 - 7. Door and frame sizes and materials.
 - 8. Submit manufacture's technical data and installation instructions for the electronic hardware.
 - 9. Catalog cuts.
- F. Templates: Where required, furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware.

1.03 QUALITY ASSURANCE:

- A. Qualifications:
 - 1. Obtain each kind of hardware (latch and locksets, exit devices, hinges, and closers) from only one manufacturer, although several may be indicated as offering products complying with requirements.
- B. Schedule Designations: Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that another manufacturer's products will not be acceptable, unless they are not equal in design, size, weight, finish function, or other quality of significance. See 1.02 A for substitutions.
- C. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.
- D. Fire-rated openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80. This requirement takes precedence over other requirements for such hardware. Provide only such hardware which has been tested and listed by UL for the type and size of door required, and complies with the requirements of the door and the door frame labels. Latching hardware, door closers, ball bearing hinges, and seals are required whether or not listed in the Hardware schedule.
- E. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label on exit device indicating "Fire Exit Hardware".
- F. Electronic Security Hardware: Coordinate installation of the electronic security with the Architect and provide installation and technical data to the Architect and other related sub-contractor(s). Upon completion of the electronic security hardware installation, verify that all components are working properly and state in the required guarantee that this inspection has been performed.

1.04 DELIVERY, STORAGE, AND HANDLING:

- A. Acceptance at the Site: Individually package each unit of finish hardware complete with proper fastening and appurtenances, clearly marked on the outside to indicate contents and specific locations in the Work.
- B. Deliver packaged hardware items at the times and to the locations (shop or field) for installation, as directed by the Contractor.

1.05 PROJECT CONDITIONS:

- A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Upon request, check the Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.06 WARRANTY:

- A. Provide guarantee from hardware supplier as follows:

1. Closers: Ten years; except electronic closers: Two years.
2. Exit Devices & Locksets: Three years
3. All other Hardware: Two years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.02 A.

Item:	Manufacturer:	Approved:	Approved	Approved
Hinges		Ives Allegion	Hager	McKinney
Continuous Hinges		Ives Allegion	Hager	McKinney
Locks		Allegion Schlage	Allegion FAL	Best
Cylinders		Schlage	Best	Medeco
Exit Devices PED5000		Allegion VD98/FAL25	Sargent 8800	Corbin
Elec. Exit Devices		Allegion VD 98	Sargent,	PHI
Flush Bolts		Ives Allegion	Rockwood	Trimco
Coordinators		Ives Allegion	Rockwood	Trimco
Silencers		Glynn Johnson	Rockwood	Trimco
Kickplates		Ives Allegion	Rockwood	Trimco
Stops		Ives Allegion	Rockwood	Trimco
Thresholds		NGP	Pemko	McKinney
Seals & Bottoms Alum. Dr. Lock		NGP Adams Rite	Pemko No Substitution	McKinney
Push/Pulls		Ives Allegion	Rockwood	McKinney
Closers		Allegion 4000/SC71	Sargent 281	Stanley 4500
Keypad Controller		Schlage	Hirsch	

- B. Furnish all items of hardware required to complete the work in accordance with Specifications and plans.
- C. Carefully inspect Project for the extent of the finish hardware required to complete the Work. Where there is a conflict between these Specification and the existing hardware, furnish finish hardware to specification. Furnish all items of hardware required to complete the work in accordance with Specifications and plans.

2.02 MATERIALS:

- A. Locksets: Mortise Type Locks and Latches shall be heavy-duty with hinged, antifriction, $\frac{3}{4}$ " throw latchbolt with anti-friction piece made of self-lubricating stainless steel. Functions and design as indicated on the hardware groups. Deadbolt functions shall be 1 inch projection made of hardened stainless steel. Both deadbolt and latchbolt are to extend into the case a minimum of $\frac{3}{8}$ inch when fully extended. Furnish locksets and latchsets with sufficient curved strike lip to protect door trim. Provide locksets with 7-pin patent protected interchangeable SFIC cylinders. All mortise cylinders shall have a concealed internal set screw for securing the cylinder to the lockset. The internal set screw will be accessible only by removing the core from the cylinder body. All mortise locksets and latchsets must conform to ANSI A156.13, Series 1000, Operational Grade 1 and be listed by UL. Lockset must fit ANSI A115.1 door preparation. Locksets and latchsets to have self-aligning, thru-bolted trim. Auxiliary deadlatch to be made of one-piece stainless steel, permanently lubricated. Lever handles must be of forged or cast brass, bronze or stainless-steel construction and conform to ANSI A117.1. Levers which contain a hollow cavity are not acceptable. Spindle to be such that if forced it will twist first, then break, thus preventing forced entry. Levers to be operated with a roller bearing spindle hub mechanism. Locksets with the IDH listed in the specifications will have Request to Exit Switch, Door Monitor Switch and Electric locking integrated into the lockset.
1. Locks shall have minimum $\frac{3}{4}$ throw. All deadbolts shall have 1-inch minimum PART 1 - throw.
 2. Comply with requirements of local security/fire/life safety ordinances.
 3. Lock Series and Design: Allegion Schlage L90MA5 Mortise w/ Deadbolt
 4. Electronic On-Line Card Reader: Galaxy.
Modular Integrated Reader Galaxy
 5. Electronic Panic Exit Device:
Allegion Von Duprin/Fal25 EL-98/99/25 Exit. Series with EPT-10 & Any Wire Chases Required to be provided by Door Manufacturer.
 6. Provide and Pull Access Control Cable back to the nearest IT/Comm Room
- B. Hinges: Out swinging exterior doors shall have continuous pin. All hinge open widths shall be minimum, but of sufficient size to permit door to swing 180. Furnish hinges with five knuckles and flush bearing.
1. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
 2. Provide hinges as listed in schedule.
 3. Provide continuous hinges as scheduled.
- C. Exit Devices: Furnish all sets at wood doors with sex bolts unless otherwise specified.

- D. Surface Door Closers: Full rack and pinion type with removable non-ferrous cover. Provide sex bolts at all wood doors. Place closers inside building, stairs, and rooms. Closers shall be non-handed, non-sized and adjustable.
 - 1. Provide multi-size 1 through 6 at all doors rated or not.
 - 2. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over.
 - 3. Drop brackets are required at narrow head rails.
 - 4. Set exterior doors closers to have 8.5 lbs maximum pressure to open, interior non-rated at 5 lbs , rated openings at 12lbs.
- E. Kickplates: Provide with four beveled edges, 10 inches high by width less 1.5 inches on single doors and 1 inch on pairs of doors. Furnish Type "A" screws to match finish.
- F. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
- G. Screws: All exposed screws shall be Phillips head.
- H. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs.
- I. Omit where any type of seals occur.
- J. ADA Operators Besam SW200i, LCN 95-Series, Horton Series 7000, with remotes.

2.03 FINISH:

- A. Generally to be BHMA 626 Satin Chrome where indicated.
- B. Protection Plates, Push, Pulls shall be BHMA 630.
- C. Spray door closers to match other hardware, unless otherwise noted.
- D. Aluminum items shall be finished to match predominant adjacent material.
- E. Seals to coordinate with frame color.

2.04 KEYING REQUIREMENTS:

- A. Provide construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished on the same keyway (or key section) as the Owner's permanent keying system. Permanent cylinders/cores and keys (prepared according to the accepted keying schedule) will be furnished.
- B. The Contractor shall include in their Bid Price the costs for all the Owner's Permanent Conventional Cylinders and SFIC-7pin Cores. Cores shall be keyed to the existing Master key system and provided to the Owner.**
- C. Furnish all Cylinders/SFIC-7pin cylinder housings for all locks and exit devices and as called for in Hardware Sets. Permanent keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts.
- D. Permanent keys will also be stamped "Do Not Duplicate."
- E. All permanent cores and keys shall be transmitted to the Owner by Registered Mail, return receipt requested.
- F. Furnish keys in the following quantities:

- 1 each Grand Masterkeys
 - 4 each Masterkeys
 - 2 each Change keys each keyed core
 - 9 each Construction masterkeys
 - G each Control key
- G. Upon installation of permanent cores by the Owner, the Owner will return the construction cores and keys to the Contractor.
- H. Keying schedule: Submit three copies of separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

PART 3 – EXECUTION

3.01 HARDWARE LOCATIONS:

- A. Provide locations as recommended by the Door and Hardware Institute.
- B. All locations shall meet all state and local codes.

3.02 INSTALLATION:

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Installation shall conform to local governing agency security ordinance.

3.03 ADJUSTING:

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Inspection: Hardware supplier shall inspect all hardware furnished within 10 days of contractor's request and include with his guarantee a statement that this has been accomplished. Inspector or Contractor shall sign off the hardware as being complete and correctly installed and adjusted. Further corrections of defective material shall be the responsibility of his representative.

3.04 SCHEDULE OF FINISH HARDWARE:

- A. Legend of listed manufacturers:
Ives NGP National Guard Products
Schlage (SCH) Von Duprin (VON) Gynn Johnson (GJ) LCN
- C. The items listed in the following "Schedule of Finish Hardware" shall conform throughout to the requirements of the foregoing specification. The last column of letters in the Hardware Schedule refers to the manufacturer abbreviation listed above, where applicable.

D. The Door Schedule on the Drawings indicates which Hardware Set is used with door.

D. HARDWARE SCHEDULE

MK - McKinney

RO - Rockwood

RU - Corbin Russwin

BE - Best Locking

RF - Rixson

NO - Norton

FAL/SC – Falcon

NGP –National Guard Products

PE – Pemko

PHI - Precision

SU - Securitron

SCH – Schlage Allegion

IVE – Ives Allegion

LCN—Allegion LCN

VON - Von Duprin

Contractor is responsible for providing the hardware schedule to be approved by the Owner and Architect. Upon submission of a draft Hardware Schedule Contractor is responsible for scheduling a Hardware Conference with the Architect and Owner for review and making corrections/resubmissions as required.

Hardware Schedule**Hardware Set # 1 – DR #'s 101 ALUM**

(2 ea.) 224XY CL LAR"	IVES	(FM Continuous Hinges)
(2 ea.) CD-98-NL-OP-630	VON	(Rim Panic Device)
(4 ea.) 1E72/74 626	BE	(Cylinder as Required)
(1 ea.) KR94-SP28 LAR	VON	(Keyed Removable Mull)
(2 ea.) 8190EZHD-2 12" 630	IVES	(Offset Pull)
(2 ea.) 4040XP CUSH 689	LCN	(Surface Closer with Hold-Open)
(1 ea.) 160V LAR	NGP	(Set of Gasketing)
(1 ea.) 101V LAR	NGP	(Sweep)
(1 ea.) 513/896V AL LAR	NGP	(Threshold)

Hardware Set # 2- DR #'s 102, 110

(2 ea.) 224XY CL LAR"	IVES	(FM Continuous Hinges)
(1 ea.) L9456-07L 626	SCH	(Corridor Function with Deadbolt)
(1 ea.) COR60-315ANw/FL as required	IVES	(Door Coordinator Bar)
(2 ea.) 4040XP HO CUSH 689	LCN	(Surface Closer with Hold-Open)
(2 ea.) FB458-12-626	IVES	(Flush Bolts)
(1 ea.) DP1 26D	IVES	(Dust Proof Strike)
(2 ea.) 8400 10" x 34" 630	IVES	(Kick Plate)
(1 ea.) 160V LAR	NGP	(Set of Gasketing)
(1 ea.) 97V LAR	NGP	(Sweep)
(1 ea.) 16A-LAR	NGP	(Rain Strip Cap)
(1 ea.) 513/896V AL LAR	NGP	(Threshold)

Hardware Set # 3 – DR #'s 111

(3 ea.) 5BB1 x 4.5"x 4.5" 26D	IVES	(Standard Weight Hinges)
(1 ea.) F-98-L-630	VON	(Rim Panic Device)
(1 ea.) 1E72/74 626	BE	(Cylinder as Required)
(1 ea.) 4040XP-CUSH-689	LCN	(Closer Cush Stop)
(1 ea.) 8400 10" x 34" 630	IVES	(Kick Plate)
(1 ea.) 5050BLK-LAR	NGP	(Set of Gasketing)

Hardware Set # 4 – DR #'s 113

(4 ea.) 5BB1-HW x 4.5"x 4.5" 26D NRP	IVES	(Heavy Weight Hinges)
(1 ea.) F-98-L-NL-630 –TB LAR	VON	(Rim Panic Device)
(1 ea.) 1E72/74 626	BE	(Cylinder as Required)
(1 ea.) 9600-LBSM 630	HES	(Electric Strike)
(1 ea.) 4040XP-CUSH-689-TB	LCN	(Closer Cush Stop)
(1 ea.) 8400 30" x 34" 630	IVES	(Armored Kick Plate)
(1 ea.) 5050BLK-LAR	NGP	(Set of Gasketing)

NOTE: PREP FRAME FOR FUTURE ACCESS CONTROL, CORRIDINATE WITH ELECTRICIAN AND OWNER'S SECURITY CONTRACTORHardware Set # 5 – DR #'s 123, 124, 125, 126, 127, 128, 129,

(3 ea.) 5BB1 x 4.5"x 4.5" 26D	IVES	(Standard Weight Hinges)
(1 ea.) CD-98 NL-OP-630	VON	(Rim Panic Device)
(2 ea.) 1E72/74 626	BE	(Cylinder as Required)
(1 ea.) 8190EZHD-2 12" 630	IVES	(Offset Pull)
(1 ea.) 4040XP-CUSH-689	LCN	(Closer Cush Stop)
(1 ea.) 8400 30" x 34" 630	IVES	(Armored Kick Plate)
(1 ea.) FS17-630	IVES	(Wall Stop)
(1 ea.) 160V LAR	NGP	(Set of Gasketing)
(1 ea.) 101V LAR	NGP	(Sweep)
(1 ea.) 16 DKB (DARK BRONZE)	NGP	(Rain Drip Cap)
(1 ea.) 513/896V AL LAR	NGP	(Threshold)

Hardware Set # 6– DR #'s 150

(1 ea.) 224XY CL LAR"	IVES	(FM Continuous Hinges)
(1 ea.) L9456-07L 626	SCH	(Corridor Function with Deadbolt)
(1 ea.) 4040XP CUSH 689	LCN	(Surface Closer)
(1 ea.) 8400 10" x 34" 630	IVES	(Kick Plate)
(1 ea.) 160V LAR	NGP	(Set of Gasketing)
(1 ea.) 101V LAR	NGP	(Sweep)
(1 ea.) 16A-lar	NGP	(Rain Drip Cap)
(1 ea.) 513/896V AL LAR	NGP	(Threshold)

Hardware Set # 7 – DR #'s 105, 122

(3 ea.) 5BB1 x 4.5"x 4.5" 26D	IVES	(Standard Weight Hinges)
(1 ea.) CD-98 NL-OP-630	VON	(Rim Panic Device)
(2 ea.) 1E72/74 626	BE	(Cylinder as Required)
(1 ea.) 8190EZHD-2 12" 630	IVES	(Offset Pull)
(1 ea.) 4040XP-CUSH-689	LCN	(Closer Cush Stop)
(1 ea.) 8400 10" x 34" 630	IVES	(Kick Plate)
(1 ea.) WS407-CCV630	IVES	(Wall Stop)

Hardware Set # 8 – DR #'s 107, 108

(3 ea.) 5BB1 x 4.5"x 4.5" 26D	IVES	(Standard Weight Hinges)
(1 ea.) 8200 8" x 16" 630	IVES	(Push Plate)
(1 ea.) 8303-10" 4" x 16" 630	IVES	(Pull Handle x Plate)
(1 ea.) 4040XP CUSH 689	LCN	(Surface Closer)
(1 ea.) 8400 10" x 34" 630	IVES	(Kick Plate)
(1 ea.) WS407-CCV 630	IVES	(Wall Stop)
(1 ea.) 5050BLK 22' LAR	NGP	(Set of Gasketing)

Hardware Set # 9 – DR #'s 103, 112, 114, 116, 119

(3 ea.) 5BB1 x 4.5"x 4.5" 26D	IVES	(Standard Weight Hinges)
(1 ea.) L9080-07L 626	SCH	(Storeroom Function Lever Lock)
(1 ea.) 1E72/74-626	BE	(Cylinder as Required)
(1 ea.) WS407-CCV 630	IVES	(Wall Stop)
(1 ea.) 5050BLK-LAR	NGP	(Set of Gasketing)

Hardware Set # 10 – DR #'s 104, 115, 117, 118, 120, 121

(3 ea.) 5BB1 x 4.5"x 4.5" 26D	IVES	(Standard Weight Hinges)
(1 ea.) L9456-07L 626	SCH	(Corridor Function with Deadbolt)
(1 ea.) 1E72/74-626	BE	(Cylinder as Required)
(1 ea.) WS407-CCV 630	IVES	(Wall Stop)
(3 ea.) SR64-GRY	IVES	(Silencer)

Hardware Set # 11 – DR #'s 109 ALUM

(2 ea.) 224XY CL LAR"	IVES	(FM Continuous Hinges)
(1 ea.) L460/463DC 626	SCH	(Mortise Deadlock as Required)
(1 ea.) 1E72/74 626	BE	(Cylinder as Required)
(1 ea.) 8200 8" x 16" 630	IVES	(Push Plate)
(1 ea.) 8303-10" 4" x 16" 630	IVES	(Pull Handle x Plate)
(2 ea.) 4040XP-CUSH-689	LCN	(Closer Cush Stop)
(2 ea.) WS407-CCV 630	IVES	(Wall Stop)
(1 ea.) 1013AL LAR	NGP	(Threshold)

Hardware Set # 12– DR #'s 106 SLIDER

(2 ea.)W70/6FT SS	PEMKO	(Sliding Track System as required)
(2 ea) STOP1	PEMKO	(Sliding Stops)
(4 ea) 102N	PEMKO	(Mortise Guides)
(6 ea) BLD-SPACER-58	PEMKO	(5/8" Spacer)
(2 ea) 9266F 18-12-630	IVES	(Straight Pull Flat)
(2 ea) 230-626	IVES	(Sliding Door Edge Pull)
(2 ea) 95B	ROCKWOOD	(Cast Flush Pull)

Hardware Set # 13 – DR #'s 140, 143, 144, 145, 146, 147, 149, 200, 201

(1 ea.) 41B-7-82-M5	IVES	(Standard Weight Hinges)
(1 ea.) 1E72/74-626	BE	(Cylinder as Required)

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed borrowed lites.
- B. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.
- C. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- H. GANA (SM) - GANA Sealant Manual; 2008.
- I. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.
- J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.
- K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch (___ by ___ mm) in size of glass units.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 - 5. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.03 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 2. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
- C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 - 1) Low-E coating shall be Vitro, Solarban 70 or equal.
 - 3. Space between lites filled with air.
 - 4. Inner Lite 1/4" annealed
 - a. Tint: Clear
 - 5. Total Thickness: 1 inch (____ mm).

6. Thermal Transmittance (U-Value), Summer - Center of Glass:.26, nominal.
7. Visible Light Transmittance (VLT): 64 percent, nominal.
8. Shading Coefficient:.32, nominal.
9. Solar Heat Gain Coefficient (SHGC):.27 percent, nominal.
10. Visible Light Reflectance, Outside: 13 percent, nominal.

2.04 GLAZING UNITS

- A. Type G-2 - Monolithic Interior Clear Vision Glazing:
 1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6.4 mm), nominal.

2.05 GLAZING COMPOUNDS

- A. Provide Glazing Compounds as required for full and complete systems and as shown on the Drawings.

2.06 ACCESSORIES

- A. Provide Accessories as required for full and complete systems and as shown on the Drawings.
- B. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- C. Remove non-permanent labels immediately after glazing installation is complete.
- D. Clean glass and adjacent surfaces after sealants are fully cured.
- E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 91 00
LOUVERS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim.
- C. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- D. Section 23 31 00 - HVAC Ducts and Casings: Ductwork attachment to louvers.
- E. Section 23 33 00 - Air Duct Accessories: Fire/smoke dampers associated with exterior wall louvers.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- C. Samples: Submit two samples 2 by 2 inches (50 by 50 mm) in size illustrating finish and color of exterior and interior surfaces.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
 - 1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Louvers:
 - 1. Airline Louvers; _____: www.airlinelouvers.com/#sle.
 - 2. Construction Specialties, Inc; Drainable Louver: www.c-sgroup.com/#sle.
 - 3. Ruskin Company 3900 Dr. Greaves Rd. Grandview, MO 64030, www.ruskin.com, 816-761-7476..

2.02 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
 - 1. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 2. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

2.03 FINISHES

- A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).
- B. Color: Custom, to match approved sample.

2.04 ACCESSORIES

- A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- B. Insect Screen: 18 x 16 size aluminum mesh.
- C. Fasteners and Anchors: Galvanized steel.
- D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Set sill members and sill flashing in continuous bead of sealant.
- D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. Coordinate with installation of mechanical ductwork.

3.03 ADJUSTING

- A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

SECTION 09 21 16
GYP SUM BOARD ASSEMBLIES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Cementitious backing board.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 21 00 - Thermal Insulation
- C. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- K. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.
- L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.

- N. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.
- O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- Q. GA-216 - Application and Finishing of Gypsum Board; 2013.

1.04 SUBMITTALS

- A. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Fire Rated Assemblies: Provide completed assemblies as required by Code and as described on the Drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich; ____: www.clarkdietrich.com/#sle.
 - 2. Jaimes Industries; ____: www.jaimesind.com/#sle.
 - 3. Marino; ____: www.marinoware.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
 - 1. Studs: "C" shaped with flat or formed webs with knurled faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
- C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
- D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging both sides.
- E. Drywall Ceiling Suspension System Components
 - 1. All components shall be heavy-duty zinc-coated hot dipped galvanized steel with chemically cleansed, zinc-coated, prefinished exposed surfaces. All materials shall conform to the performance standards of ASTM C635, C645 and C653.
 - 2. Main beams with double-web construction, 1-11/16" height profile with peaked roof top bulb and 1-1/2" knurled flange spaced at 48" on center shall be Armstrong component HD8906 or approved equal.
 - 3. Primary Cross beams with double-web construction, 1-1/2" height profile with peaked roof top bulb and 1-1/2" knurled flange spaced at 28" on center shall be Armstrong component XL8945P or approved equal.
 - 4. Hemmed Angle Wall molding with 1-1/4"x1-1/4" nominal legs shall be Armstrong component KAM10 or KAM 12 or approved equals.

5. Galvanized Hanger Wire: 8 gage.
6. 18 gage Galvanized Tie Wire.
7. Accessories including clips and screws per manufacturer's recommendations

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 1. American Gypsum Company; ____: www.americangypsum.com/#sle.
 2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
 3. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle.
 4. National Gypsum Company; ____: www.nationalgypsum.com/#sle.
 5. USG Corporation; ____: www.usg.com/#sle.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - b. Mold resistant board is required at all toilets, wet walls and all other areas indicated on drawings.
 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 5/8 inch (16 mm).
 5. Paper-Faced Products:
 - a. American Gypsum Company; LightRoc Gypsum Wallboard.
 - b. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
 - c. USG Corporation; Sheetrock Brand Gypsum Panels..
 - d. CertainTeed Corporation; ProRoc Brand Gypsum Board..
 6. Mold Resistant Paper Faced Products:
 - a. American Gypsum Company; M-Bloc Type X.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
 - c. USG Corporation; Moldtough Firecode Type X.
- C. Impact Resistant Wallboard:
 1. Application: in rooms as indicated on the Finish Schedule.
 2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Hard Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 8. Type: Fire-resistance-rated Type X, UL or WH listed.
 9. Thickness: 5/8 inch (16 mm).
 10. Edges: Tapered.
- D. Backing Board For Wet Areas:

1. Application: Surfaces behind tile in wet areas including toilet rooms.
2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch (12.7 mm).
- E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 5/8 inch (____ mm).
 3. Edges: Tapered.
 4. Products:
 - a. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board.
- F. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (610 mm) wide, beveled long edges, ends square cut.
 1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
 2. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Shaft Liner:
www.americangypsum.com/#sle.
 - b. National Gypsum Company; Gold Bond Fire-Shield Shaftliner XP:
www.nationalgypsum.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; Owens Corning Sound Attenuation Batt Insulation unfaced, preformed glass fiber, friction fit type. Flame Spread 10 (Class A). Locate in Toilet room walls (when studs), above ceilings and as other wise shown in plans. Thickness: 3-1/2 x 16 inch (____ mm) and 5-1/2 x 16 inch.
- B. Joint Accessories and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) ClarkDietrich; Quicksilver Corner Bead (CBS):
www.clarkdietrich.com/#sle.
 - 2) Metal.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 2. Control Joint
 - a. Products:
 - 1) ClarkDietrich; [Quicksilver Corner bead (CBS)]:
www.clarkdietrich.com/#sle. : 093 Zinc control joint
 3. Metal L- Trim
 - a. Products:
 - 1) ClarkDietrich; [Metal L Trim #200-B M20B]:
www.clarkdietrich.com/#sle.
 4. Metal Reveal Trim
 - a. Architectural Reveal Trim:
 - 1) Reveal Depth: 5/8 inch (16 mm).
 - 2) Reveal Width: 5/8 inch (16 mm). Z reveal trim.
 - (a) Color and Finish as slected by Architect from manufactures standard powder coat painted finishes.
 - 3) Shapes and Extents: As indicated on drawings.
 - 4) Products:

- (a) Fry Reglet Corporation, www.fryreglet.com.
 - (b) Substitutions: See Section 01 60 00 - Product Requirements.
- b. Expansion Joints:
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 2. Ready-mixed vinyl-based joint compound.
 - 3. Joint Compound: Drying type, vinyl-based, ready-mixed.
 - a. Products:
 - 1) CertainTeed Corporation; Extreme All-Purpose Joint Compound: www.certainteed.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- D. Finishing Compound: Surface coat and primer, takes the place of skim coating.
 - 1. Products:
 - a. CertainTeed Corporation; Quick Prep Plus Interior Prep Coat: www.certainteed.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
 - 1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches (600 mm) on center.
 - 2. Install studs at spacing required to meet performance requirements.
- B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
 - 1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
 - 2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Laterally brace entire suspension system.
 - 2. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes.

3. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads and as specified along the length of the main beams.
 4. Install cross tees at 24" on center spacing.
 5. Use angle molding to interface with drywall grid system to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc. as shown in drawings.
 6. Use secondary framing cross tees as required to frame light fixtures and other ceiling mounted devices.
- C. Studs: Space studs as indicated.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
 4. Brace all framing as indicated and to meet IBC requirements. Provide all bridging and blocking as required and as needed for attachments.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
1. Orientation: Horizontal.
 2. Spacing: As indicated.
- F. Blocking: Install wood blocking for support of:
1. Framed openings.
 2. Wall mounted cabinets.
 3. Plumbing fixtures.
 4. Toilet partitions.
 5. Toilet accessories.
 6. Wall mounted door hardware.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and no more than 20 feet apart.
1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Reveal Trim: install where indicated.

3.05 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
 2. Taping, filling, and sanding are not required at base layer of double-layer applications.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Stone thresholds.
- D. Ceramic accessories.
- E. Ceramic trim.
- F. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- C. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).
- E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
- F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
- G. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
- I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

- J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
- K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
- L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- M. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).
- O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.
- P. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).
- Q. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).
- R. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Revised).
- S. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.
- T. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation; 2014.
- U. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.
- V. ANSI A137.3 - American National Standard Specifications for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2017.
- W. ASTM C373 - Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products, Ceramic Tiles, and Glass Tiles; 2014a.
- X. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- Y. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.
- Z. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.
- AA. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

- C. Samples: Provide Samples for each selected tile type. Provide Samples of complete color range for Color Selection.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 10 square feet (1 square meters) of each size, color, and surface finish combination.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 MOCK-UP

- A. Construct tile mock-up in one restroom, incorporating all components specified for the location.
 - 1. Minimum size of mock-up is 6'-0"x6'-0".
 - 2. Approved mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers: All products of each type by the same manufacturer.
 - 1. Dal-Tile Corporation: www.daltile.com/#sle.
 - 2. Anatolia Tile and Stone: <http://www.anatoliatile.com/>.
- B. Porcelain Tile, Type Tile #1: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: 12 by 24 inch (by mm), nominal.
 - 3. Thickness: 3/8 inch (mm).
 - 4. Edges: Square.
 - 5. Surface Finish: Matte glazed.
 - 6. Color(s): Mica
 - 7. Pattern: As Indicated on drawings.
 - 8. Trim Units: Matching bullnose base shapes in 3 X24 inches.
 - 9. Products: Basis of Design
 - a. Anatolia Tile and Stone: <http://www.anatoliatile.com/>.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Porcelain Tile, Type Tile #2: ANSI A137.1, standard grade.
 - 1. Size: 6 by 6 inch (by mm), nominal.
 - 2. Thickness: 5/16 inch (mm).
 - 3. Edges: Square.
 - 4. Surface Finish: Gloss.
 - 5. Color(s): 0182 Suede Gray
 - 6. Pattern: As Indicated on drawings.
 - 7. Products: Basis of Design
 - a. Dal-Tile Corporation; Color Wheel Classic: www.daltile.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: brushed stainless steel (satin nickel if stainless not available), style and dimensions as indicated on drawings, for setting using tile mortar or adhesive.

1. Applications/Products:
 - a. Tile to Conc - Marble transition - See Drawings
 - b. Door Threshold at Tile - Marble transition - See Drawings
 - c. Tile to VCT - Schluter Reno MU - 100 (height to accommodate tile thickness)
 - d. Tile to CPT Tile - Schluter Reno MU - 100 (height to accommodate tile thickness).
 - e. Outside Corners - Schluter Jolly (height to accommodate tile thickness).
2. Manufacturers: Basis of Design
 - a. Schluter-Systems: www.schluter.com/#sle.
3. Expansion Joint Sealant: Equal to Summitville #S-48. Mix sand from grout mixture into surface of sealant.
4. Tile Cleaner as acceptable to manufacturers of Tile and Grout.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
 1. LATICRETE International, Inc; _____: www.laticrete.com/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 2. Products:
- D. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
 1. Products:
 - a. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
 - b. or approved equal.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Grout joint width: 1/8 inch.
- C. Manufacturers:
 1. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 2. Or approved equal.
- D. Standard Grout: ANSI A118.6 standard cement grout.
 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
 4. Products:
 - a. LATICRETE International, Inc; LATICRETE Permacolor: www.laticrete.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.

1. Crack Resistance: No failure at 1/8 inch (3.2 mm) gap, minimum.
2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 20 mils (0.5 mm), maximum.
 - c. Products:
 - 1) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Mortar Bonded Sheet Type:
 - a. Material: Chlorinated polyethylene sheet membrane with polyester fabric laminated to both sides, 30 mils (0.8 mm), thick, minimum.
 - b. Products shall be provided by one manufacturer in warranted system:
 - 1) KERDI waterproofing membrane as manufactured by Schluter Systems, 194 Pleasant Ridge Road, Plattsburg, NY 12901.
 - 2) KERDI-BAND Seams and Corners..
 - 3) KERDI-SEAL Mixing Valve Seals.
 - 4) KERDI-SEAL Pipe Seals.
 - 5) Other system components to make warranted membrane system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
- E. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- F. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Install non-ceramic trim in accordance with manufacturer's instructions.
- H. Install thresholds where indicated.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep control and expansion joints free of mortar, grout, and adhesive.
- K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Use uncoupling membrane under all tile unless other underlayment is indicated.
 - 2. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.
 - 3. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F131.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - SHOWERS AND BATHTUB WALLS

- A. At shower walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane.
- B. Grout with standard grout as specified above.

3.06 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms and locker rooms.
- B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.07 CLEANING

- A. Clean tile and grout surfaces.

3.08 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 51 00 ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 31 00 - Steel Decking: Placement of special anchors or inserts for suspension system.
- C. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- D. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.
- E. Section 28 46 00 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- C. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two full size samples illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 12 inches (____ mm) long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Acoustical Tiles/Panels:
 - 1. Armstrong World Industries, Inc; ____: www.armstrong.com/#sle.
 - 2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
 - 3. Hunter Douglas Contract; ____: www.hunterdouglascontract.com.
 - 4. USG Corporation; ____: www.usg.com/#sle.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. VOC Content: As specified in Section 01 61 16.
- B. Acoustical Panels, Type ACT 1: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - 2. Size: 24 by 48 inch (610 by 1219 mm).
 - 3. Thickness: 3/4 inch (19 mm).
 - 4. Panel Edge: Angled Tegular.
 - 5. Color: White.
 - 6. Suspension System Type Prelude XL 15/16": Exposed grid.
 - 7. Products:
 - a. Armstrong World Industries, Inc; Fine Fissured: www.armstrongceilings.com/#sle. or equal.

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12-gage 0.08 inch (2 mm) galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
 - a. Products:
 - 1) AX6STR by Armstrong World Industries, Inc.
 - b. Dimensions: 120 x 3/4 x 6 inches
 - c. Finish: Match Suspension System finish.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- B. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- D. Section 06 10 00 Rough Carpentry.

1.03 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).
- C. ASTM F1700 - Standard Specification for Solid Vinyl Tile; 2013a.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.
- F. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2004 (Reapproved 2014).
- G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.
- H. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS**2.01 SHEET FLOORING**

- A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.
 - 1. Manufacturers:
 - a. Mohawk Group; www.mohawkgroup.com; Healthy Environments Resilient, Medella Fleck..
 - b. or approved equal.
 - 2. Minimum Requirements: Comply with ASTM F1913.
 - 3. Thickness: 0.080 inch (2.0 mm) nominal.
 - 4. Sheet Width: 79 inch (____ mm) minimum.
 - 5. Seams: Chemically bonded using seam sealer.
 - 6. Color: To be selected by Architect from manufacturer's full range.

2.02 TILE FLOORING

- A. Vinyl Tile: Solid vinyl with color and pattern throughout thickness.
 - 1. Manufacturers:
 - a. Mohawk Group; www.mohawkgroup.com; Hot and Heavy Collection, Bolder.
 - 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 3. Square Tile Size: 36 by 36 inch (____ by ____ mm).
 - 4. Wear Layer Thickness: 20 mil (0.5 mm)
 - 5. Total Thickness: 5 m
 - 6. Color: 888 Schist.

2.03 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
 - 1. Manufacturers:
 - a. Flexco Corporation :www.flexcofloors.com
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Height: 6 inch (150 mm).
 - 3. Thickness: 0.125 inch (3.2 mm).
 - 4. Finish: Satin.
 - 5. Length: Roll.
 - 6. Color: To be selected by Architect from manufacturer's full range.
 - 7. Accessories: Premolded external corners.

2.04 ACCESSORIES

- A. Underlayment approved by sheet vinyl manufacturer for installation of sheet vinyl over plywood subfloor; minimum 1/4" thickness.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Vinyl Composition Tile to Carpet Transitions: Tile Carpet Joiner #177 by Roppe. Color to be selected by Architect.

- D. Vinyl Composition Tile to Concrete Transitions: 3/16" Glue-down Reducer #160 by Roppe. Color to be selected by Architect.
- E. Carpet to Concrete Transitions: 5/16" Glue-down Reducer #156 by Roppe. Color to be selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- D. Prohibit traffic until filler is fully cured.
- E. Clean substrate.
- F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
 - 1. Install Underlayment approved by sheet vinyl manufacturer under sheet vinyl over plywood subfloor; minimum 1/4" thickness.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Chemically bond seams using seam sealer where indicated.

3.05 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

3.06 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.07 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 13 TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.
- B. This Section shall include the furnishing of all carpet complete including carpets, binder bar, vinyl edge reducing and edge strip where required, and in sufficient quantity for a complete installation in all areas of the buildings as noted on finish schedule and herein specified.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Mohawk Group: www.mohawkgroup.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Tile Carpeting, Type CPT 1: Refined Pass, manufactured in one color dye lot.
 - 1. Product: Crossing Current Collection, Refined Pass manufactured by Mohawk Group.
 - 2. Tile Size: 24 x 24 inch (____by____ mm), nominal.
 - 3. Color: 989 Dakota
 - 4. Pattern: Brick Ashlar.

2.03 ACCESSORIES

- A. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.
- B. Use contact cement on vertical surfaces and as recommended by carpet manufacturer.
- C. Edge Protection/Transition:
 - 1. Transition between floor finishes of different heights shall be Schluter RENO-U or equal with Aluminum, satin anodized finish (AE) with height as required for thickness of specified flooring materials. Edging component to have sloped exposed surface, integrated trapezoid-perforated anchoring let, and integrated joint spacer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. **Installer shall inspect all sub-flooring surfaces** which to determine that all are a smooth level plane, free from any imperfections and free from dirt and dust. Notify the General Contractor in writing, with copies to the Architect and/or Owner, if any conditions exist that would be detrimental to proper installation of the carpet. The application of any carpet shall be an indication of the Carpet Contractor's acceptance of the sub-surface conditions and he shall be held responsible for any defects after laying the carpet.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. The Carpet Contractor shall verify all dimensions for the carpet at the building site before supplying and cutting carpet.

3.03 INSTALLATION

- A. The application of any carpet shall be an indication of the Carpet Contractor's acceptance of the sub-surface conditions and he shall be held responsible for any defects after laying the carpet.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Where movable partitions are shown, install resilient flooring before partitions are erected.
- D. Installation shall be direct-glue-down method, using waterproof adhesive as recommended by the Carpet Manufacturer.
- E. Carpet shall be installed in accordance with Carpet Manufacturer's recommendation for seaming techniques and seaming cement.
- F. Carpet shall be installed wall to wall using brick pattern. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters.
- G. Blend carpet from different cartons to ensure minimal variation in color match.
- H. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- I. Lay carpet tile in Half-Lap pattern, with pile direction parallel to next unit, set aligned as indicated on shop drawings, unless otherwise shown.
- J. Fully adhere carpet tile to substrate.
- K. Trim carpet tile neatly at walls and around interruptions.
- L. Installed carpet shall be free of spots, dirt or soil and shall be without tears, frays, or pulls.
- M. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. On completion of the installation on each floor, all dirt, carpet scraps, etc., must be removed from the surface of the carpet.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

3.05 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
- B. Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Prime surfaces to receive wall coverings.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 6. Floors, unless specifically so indicated.
 - 7. Ceramic and other tiles.
 - 8. Glass.
 - 9. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- C. Paints:

1. Benjamin Moore & Co: www.benjaminmoore.com/#sle.
 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 3. Farrell-Calhoun: www.farrellcalhoun.com/#sle.
- D. Primer Sealers: Same manufacturer as top coats.
- E. Block Fillers: Same manufacturer as top coats.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 3. Supply each coating material in quantity required to complete entire project's work from a single production run.
 4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
1. Gypsum Board: Interior Latex Primer Sealer; MPI #50. Benjamin Moore Ultra Spec 500 Interior Latex Primer N534, MPI #50, 50 X-Green, 149, 149 X-Green
 2. Concrete: Same as top coats.
 3. Concrete Masonry: Interior/Exterior Latex Block Filler; MPI #4. Benjamin Moore Hi-Build Masonry Block Filler 571, MPI #4, 4 X-Green
 4. Plaster: Interior Latex Primer Sealer; MPI #50. Benjamin Moore Ultra Spec 500 Interior Latex Primer N534, MPI #50, 50 X-Green, 149, 149 X-Green
 5. Wood: Latex Primer for Interior Wood; MPI #39. Benjamin Moore Fresh Start Multi-Purpose Latex Primer N023, MPI # 6, 17, 17 X-Green, 39, 137, 137 X-Green
 6. Steel, Uncoated: Anti-Corrosive Acrylic Primer for Metal; _____. Benjamin Moore Ultra Spec HP Acrylic Metal Primer HP04 (48 g/L), MPI # 107, 107 X-Green, 134
- C. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
- D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
 2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint WE-OP-3A - Wood, Opaque, Latex, 3 Coat:
1. One coat of Latex primer sealer. Benjamin Moore Fresh Start Multi-Purpose Latex Primer N023, (48.2 g/L), MPI # 6, 17, 17 X-Green, 39, 137 137 X-Green
 2. Satin: Two coats of latex enamel; _____. Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15

- B. Paint CE-OP-3L - Masonry/Concrete, Opaque, Latex, 3 Coat:
 - 1. First Coat. Benjamin Moore Hi-Build Masonry Block Filler 571 (45 g/L), MPI #4, 4 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified
 - 2. Satin: Two coats of latex enamel; _____. Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15
- C. Paint CE-OP-2A - Masonry, Opaque, Acrylic, 2 Coat: For All Exterior Existing Masonry to be painted.
 - 1. Two coats, Benjamin Moore, Texcrete WB Texture Waterproofer Smooth Texture 3194 Line, custom color to be provided by Architect, may require dark base.
- D. Paint ME-OP-3A - Ferrous Metals, Unprimed, Acrylic Urathane, 3 Coat:
 - 1. One coat of alkyd primer.
 - 2. One coat of alkyd acrylic primer. Benjamin Moore Corotech Acrylic Metal Primer V110
 - 3. Satin: Two coats of alkyd waterborne acrylic urethane. Benjamin Moore Corotech Command V392
- E. Paint ME-OP-2A - Ferrous Metals, Primed, Acrylic Urethane, 2 Coat:
 - 1. Touch-up with rust-inhibitive Benjamin Moore Corotech Acrylic Metal Primer V110.
 - 2. Satin: Two coats of waterborne acrylic urethane. Benjamin Moore Corotech Command V392 .
- F. Paint MgE-OP-3A - Galvanized Metals, Acrylic Urathane, 3 Coat:
 - 1. Clean with Corotech Oil and Grease Emulsifier V600 or solvent wiping in accordance with SSPC-SP1 prior to coating _____.
 - 2. One coat of acrylic primer. Benjamin Moore Corotech Acrylic Metal Primer V110
 - 3. Satin: Two coats of waterborne acrylic urethane. Benjamin Moore Corotech Command V392 .
- G. Paint MexE-OP-3A - Existing factory finished metal.
 - 1. One coat bonding primer; Benjamin Moore, Waterborne Bonding Primer V175.
 - 2. Sei-gloss: Two coats of acrylic enamel; Benjamin Moore, DTM V331.

2.04 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - All Interior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry, brick, wood, shop primed steel, and galvanized steel.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138-141.
 - 3. Velvet: MPI gloss level 2; use this sheen at all locations.
 - 4. Primer(s): As recommended by manufacturer of top coats.
- B. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
 - 1. Shop primer by others.
 - 2. One top coat; white.
 - 3. Top Coat: Latex Dry Fall; MPI #118, 155, 226.
 - 4. Eggshell: MPI gloss level 3; use this sheen at all locations.
- C. Paint I-TR-C - Transparent Finish on Concrete Floors, Unless Otherwise Indicated:
 - 1. 1 coat stain.
 - 2. Sealer: Water Based for Concrete Floors; MPI #99.
- D. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:

1. One Coat: Benjamin Moore Fresh Start Multi-Purpose Late Primer N023, MPI # 6, 17, 17 X-Green, 39, 137, 137 X-Green
 2. Semi Gloss: Two coats of latex enamel; Benjamin Moore Ultra Spec 500 Interior Semi-Gloss N539 (0 g/L), MPI # 43, 43 X-Green, 146, 146 X-Green, 140, 140 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified
- E. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:
1. Two coats: Benjamin Moore, Hi-Build Masonry Block Filler 571, MPI #4, 4 X-Green
 2. Semi-gloss: Two coats of latex enamel; Benjamin Moore ,Ultra Spec 500 Interior Semi-Gloss N539 (0 g/L), MPI # 43, 43 X-Green, 146, 146 X-Green, 140, 140 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified
- F. Paint MI-OP-3L - Ferrous Metals, Unprimed, Acrylic Urethane, 3 Coat:
1. One coat of acrylic primer. Benjamin Moore Corotech Acrylic Metal Primer V110.
 2. Satin: Two coats of waterborne acrylic urethane. Benjamin Moore Corotech Command V392; _____.
- G. Paint MgI-OP-3A - Galvanized Metals, Acrylic Urethane, 3 Coat:
1. Clean with Corotech Oil and Grease Emulsifier V600 or solvent wiping in accordance with SSPC-SP1 prior to coating. _____.
 2. One coat of acrylic primer. Benjamin Moore Corotech Acrylic Metal Primer V110
 3. Satin: Two coats of waterborne acrylic urethane. Benjamin Moore Corotech Command V392
- H. Paint CI-OP-3E - Concrete/Masonry, Epoxy Enamel, 3 Coat:
1. Two coats: Benjamin Moore, Hi-Build Masonry Block Filler 571, MPI #4, 4 X-Green
 2. Semi Gloss: Two coats of pre - catalyzed epoxy enamel; _____.Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), CHPS Certified, CDPH v1 Emission Certified
- I. Paint GI-OP-3L - Gypsum Board/Plaster Walls, Latex, 3 Coat:
1. One coat of Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, 50 X-Green, 149, 149 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified.
 2. Eggshell: Two coats of latex enamel; Benjamin Moore,Ultra Spec 500 Interior Eggshell N538 (0 g/L), MPI # 52, 52 X-Green, 139, 139 X-Green, 145, 145 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified.
- J. Paint GI-OP-3LA - Gypsum Board/Plaster Ceiling, Latex-Acrylic, 3 Coat:
1. One coat of Benjamin Moore ,Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, 50 X-Green, 149, 149 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified..
 2. Flat: Two coats of latex enamel-acrylic; Benjamin Moore, Latex Enamel 275. Ultra Spec 500 Interior Flat N536 (0 g/L), MPI # 52, 52 X-Green, 139, 139 X-Green, 145, 145 X-Green, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified. (Use Semi Gloss in wet areas where applicable. Benjamin Moore Ultra Spec 500 Interior Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED v4 Certified, CHPS Certified, CDPH v1 Emission Certified.).

2.05 COLORS

- A. Schedule of Colors: A color schedule will be provided during construction. A typical wall color and 3-4 accent colors may be selected.

2.06 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Pressure wash existing painted metal and existing masonry thoroughly.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean

surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

- K. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- L. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- M. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's instructions.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All interior and exterior signage as described on the Drawings and Signage Schedule.
- B. Building identification signs.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.03 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures.
- B. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- C. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- E. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- F. Selection Samples: Where colors are not specified, submit actual material color chips for selection, and two sets of selected chips for project documentation.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Store tape adhesive at normal room temperature.

1.05 MOCK UP - VINYL SIGNAGE

- A. Architect to select six potential vinyl signage materials from manufacturer's full range of selections for use as a mock up in the field, installed on the south elevation.
- B. Provide and install 48 inch x 48 inch test graphic in all six materials for Owner and Architect's review and selection. Test graphic to be provided by the Architect.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Signs, Letters and Plaques:
 - 1. Best Sign Systems, Inc; ____: www.bestsigns.com/#sle.
 - 2. Inpro; ____: www.inprocorp.com/#sle.
 - 3. Mohawk Sign Systems, Inc; ____: www.mohawksign.com/#sle.
 - 4. Gemini Inc.; www.geminisignproducts.com
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Dimensional Letter Signs:
 - 1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
 - 2. Inpro; ____: www.inprocorp.com.
 - 3. Gemini Inc.; www.geminisignproducts.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Other Signs - Vinyl Letters and Graphics:
- D. Plaques:
 - 1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
 - 2. _____.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ABAAS Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: See signage schedule and drawings for type and locations.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
 - 3. Provide windows for replaceable occupant names, removable components, and other features as described on Drawings.
 - 4. Size as shown on Drawings.
 - 5. Interior and Exterior Grade signs.
- C. Building Identification Signs:
 - 1. Use individual metal letters– 12" Stainless Steel mounted 1/2" off surface with stainless steel spacers. Letters equal to Gemini Inc. 103 Mensing Way, Cannon Falls, MN. 55009, 1-800-LETTERS. Water jet cut Stainless Steel, Natural Satin, Times Roman Font, 12" height, 1" thick. Letters to be threaded holes for insertion of back mount stud. Set studs in epoxy. Mount using template to be evenly spaced, level and plumb.
 - 2. Mount on outside wall in location indicated on drawings.
- D. Other Dimensional Letter Signs: Wall-mounted.

2.03 SIGN TYPES

- A. Acrylic Room, Regulatory and Directory Signage:
 - 1. Basis of Design is Graphic Process Series 200A - Sand Carved using Format D or approved equal.

- a. Melamine plastic laminate, approximately 1/8" thick with contrasting core color.
 - b. Size, graphics, letters, components as shown on Drawings.
 - c. Artwork to be provided by Architect.
- B. Cast Metal Plaques:
1. Cast Aluminum and/or Bronze, foundry fabricated, with raised letters and/or graphics and finishes as shown on Drawings.
 2. Final Text and Artwork to be provided by Architect.
 3. Border style and background finishes to be selected by Architect.
- C. Vinyl Letters and Graphics:
1. Permanent and removable cut vinyl letters and graphics to be mounted on metal, painted surfaces, wood, acrylic, or glass.
 2. Size and locations as shown on Drawings.
 3. Final text and graphics to be Provided by Architect.

2.04 TACTILE SIGNAGE MEDIA

- A. Etched Metal Panels:

2.05 PLAQUES

- A. Metal Plaques:
1. Metal: Aluminum casting.
 2. Metal Thickness: 1/8 inch (3 mm), minimum.
 3. Size: _____ inches by _____ inches (_____ mm by _____ mm).
 - a. As shown on Drawings.
 4. Text and Typeface:
 - a. As shown on Drawings.
 5. Border Style: As indicated on drawings.
 6. Background Texture: to be selected from Manuf. standard options.
 7. Surface Finish: Brushed, satin.
 8. Painted Background Color: Light oxide stain.
 9. Protective Coating: Manufacturer's standard clear coating.
 10. Mounting: Blind studs.

2.06 DIMENSIONAL LETTERS

- A. Metal Letters:
1. Metal: Aluminum casting.
 2. Metal Thickness: 1/8 inch minimum (3 mm).
 3. Letter Height: _____ inches (_____ mm).
 4. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper case only.
 5. Finish: Brushed, satin.
 6. Mounting: Concealed screws.

2.07 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Exposed Screws: Finish to be selected by Architect.
- C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Locate signs where indicated: see signage schedule.
- E. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.02 RELATED REQUIREMENTS

- A. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Samples: Submit two samples of partition panels, 12 by 12 inch (____ by ____ mm) in size illustrating panel finish, color, and sheen.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments:
 - 1. Scranton Products (Santana/Comtec/Capital):
www.scrantonproducts.com/#sle.
 - 2. Bradley Corporation, The Mills Company, Menomonee Falls, WI 53051;
Bradmar Partitions: www.bradleycorp.com.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Doors:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: as indicated on Drawings.
 - c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
 - d. Height: 55 inch (1397 mm).
 - 2. Panels:
 - a. Thickness: 1 inch (25 mm).
 - b. Height: 55 inch (1397 mm).
 - c. Depth: As indicated on drawings.
 - 3. Pilasters:
 - a. Thickness: 1 inch (25 mm).

- b. Width: As required to fit space; minimum 3 inch (76 mm).

2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
- B. Head Rails: Extruded aluminum, anti-grip profile.
 - 1. Size: Manufacturer's standard size.
 - 2. Headrail Brackets: 20 gauge stainless steel with satin finish. Secured to the wall with stainless steel tamper resistant Torx head screws.
- C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
- E. Hinges: Stainless steel, manufacturer's standard finish.
 - 1. Continuous-type hinge, self closing.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - 3. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 22 13 WIRE MESH PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wire mesh systems for walls and hinged gates and sliding gates.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 1. Wire Mesh Partition Systems include Interior Walls and Doors as described in the Drawings.
- B. Section 08 71 00 - Door Hardware: Cylinders for locksets.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
- C. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel; 2013.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Design Documents: Provide design criteria, design assumptions, structural calculations, fabrication and construction details, required clearances, and interface requirements. Affix Design Engineer's State of Mississippi seal.
- C. Product Data: Provide detailed specification of construction and fabrication, data for screen materials, finishes, preparation instructions and recommendations, and storage and handling requirements and recommendations.
- D. Shop Drawings: Indicate plan and vertical dimensions, description of materials and finishes; general construction, note specific modifications, elevations, component details; head, jamb, and sill details; location of hardware. Provide component details, anchorage, and type and location of fasteners.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.05 QUALITY ASSURANCE

- A. Engineer's Qualifications: A professional engineer who is legally qualified to practice in the State of Mississippi and who is experienced in providing engineering services of the kind indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wire Mesh Partitions:

1. SpaceGuard Products; FordLogan Woven Wire Mesh, Heavy Duty, Partitionswww.spaceguardproducts.com
2. Acorn Wire and Iron Works, Inc; Heavy Duty: www.acornwire.com/#sle.
3. The G-S Company; Sure Guard Heavy Duty: www.g-sco.com/#sle.
4. Miller Wire Works, Inc; Heavy Duty: www.millerwireworks.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Existing components may be salvaged and reused as long as the scope and detailing meet the requirements herein and are described in the required submittals.
- B. Woven Wire Mesh: Heavy duty.
 1. Material: ASTM A510/A510M uncoated crimped steel wire.
 2. Wire Size: 6 gage, 0.192 inch (4.9 mm).
- C. Framing and Support Members:
 1. Material: ASTM A36/A36M steel shapes and ASTM A500/A500M cold-formed steel.
 2. Framing, Corner Posts, and Intermediate Support Members: Manufacturer's standard sizes for system specified and as indicated on drawings.
 3. Vertical Stiffeners: As required for partitions greater than 144 inches (3658 mm) in height.
- D. Doors: Same material as partitions, fully framed; manufacturer's standard construction and hardware for swing and sliding operation.
 1. Locking: Mortise type cylinder locks, keyed on outside, operated by lever inside.
 2. Size and configurations: See Drawings.
- E. Sheet Metal Base Panel: ASTM A1008/A1008M, cold rolled steel sheet.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.03 DESIGN CRITERIA

- A. Provide Design as described herein.
- B. Design partition system to provide for movement of components without damage, undue stress on fasteners or other detrimental effects, when subject to design loads.
- C. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- D. Design system to meet applicable structural requirements of the IBC but not less than the following:
 1. Partition, including vertical and horizontal framing - designed to resist horizontal load not less than 5 psf.
 2. Infill Panel Systems (Guards) - designed to resist a linear load of 50 psf and a concentrated load of 200 psf.
 3. Swing and Sliding Gates as components of a means of egress - designed for heavy duty warehouse use and to comply with the requirements of Section 1010 of the IBC.

2.04 WIRE MESH PARTITIONS

- A. Wire Mesh Partitions: Factory-fabricated modular assemblies of wall panels, doors, anchors, and accessories as required to provide a complete system and as indicated.

2.05 FASTENERS

- A. Bolts, Nuts and Washers: Hot dip galvanized.
- B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.
- C. Postinstalled Expansion Anchors: With capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Carbon steel: Zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition (mild)
 - 2. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.

2.06 FABRICATION

- A. Fabricate assemblies of framed sections; to sizes and profiles required; with framing members fitted, reinforced and braced to suit design requirements.
- B. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- C. Fabricate items with joints tightly fitted and secured.
- D. Grind exposed welds smooth and flush with adjacent finish surface. Ease exposed edges to small uniform radius.
- E. Make exposed joints flush or tight.
- F. Provide components required for anchorage to adjacent construction. Fabricate anchorage and related components of same material and finish as framing members.

2.07 FINISHES

- A. Painted Finish: Manufacturer's standard powder coat finish.
 - 1. Color: to be selected by Architect.
 - 2. Color for Existing Components: refinished to match new.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install partitions and gates plumb and level, accurately fitted, properly aligned, securely fastened, and free from distortion or defects.

3.03 ADJUSTING

- A. Adjust hinged doors to achieve smooth operation without binding.
- B. Adjust locks to provide smooth and secure operation.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 CLEANING

- A. Remove temporary protection to prefinished surfaces.

END OF SECTION

SECTION 10 26 00 WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Corner guards fabricated from rolled metal sections or bent plate.
- B. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 24 inches (610 mm) long.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Stock Materials: One package(s) of minimum 96 inches (2438 mm) long unit of each kind of covers for corner guards, bumper rails, and protective corridor handrails.

1.05 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Construction Specialties, Inc; Acrovyn Solid Color and Chameleon Corner Guards: www.c-sgroup.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PRODUCT TYPES

- A. Corner Guards - Flush Mounted:
 - 1. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
 - 2. Performance: Resist lateral impact force of 100 lbs (445 N) at any point without damage or permanent set.
 - 3. Model: SFS-20N for non rated walls. SFS-20RN for Fire Rated walls.

4. Fire Resistance: Where fire rating is specified for the wall in which the guard is mounted, provide assemblies that have been tested in accordance with ASTM E119 for the same rating as the wall.
5. Width of Wings: 2 inches (51 mm).
6. Corner: Square.
7. Color: As selected from manufacturer's standard colors.
8. Length: One piece. Full height, see reflected ceiling for ceiling heights.
9. Locations: as indicated on Finish Schedule.

2.03 FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

2.04 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 6 inch (_____ mm) above finished floor to ceiling.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch (6 mm).

3.04 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Accessories for toilet rooms, showers, and utility rooms.
- D. Diaper changing stations.
- E. Utility room accessories.
- F. Grab bars.

1.02 RELATED REQUIREMENTS

- A. Section 08 83 00 - Mirrors: Other mirrors.
- B. Section 09 30 00 - Tiling: Ceramic washroom accessories.
- C. Section 10 21 13.19 - Plastic Toilet Compartments.
- D. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Commercial Toilet, Shower, and Bath Accessories:

1. Bradley Corporation; _____: www.bradleycorp.com/#sle.
2. BOBRICK Washroom Equipment, Inc.
3. Substitutions: Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- E. Adhesive: Two component epoxy type, waterproof.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: No. 4 Brushed finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: (B) Double roll, surface mounted bracket type, see basis of design product below.
 1. Products:
 - a. Bradley Toilet Tissue Dispenser 5402 (172nd std).
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- B. Paper Towel Dispenser: (I) Roll paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.
 1. Capacity: 8 inch roll minimum.
 2. Products:
 - a. Bradley Paper Towel Dispenser (172nd std)
 - 1) Model 2484-100000 Semi-Recessed when located on a wall above countertop or wall-mounted plumbing fixture.
 - 2) Model 2484-000000 Recessed (recessed 10 1/4") when located on a wall NOT above countertop or wall-mounted plumbing fixture.
- C. Waste Receptacle: (S) Stainless steel, freestanding style with swing top.
 1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of four points with stainless steel grommets and hooks.
 2. Products:
 - a. Bradley 36-gallon Waste Receptacle Model 377 (172nd std).
- D. Soap Dispenser - Wall: (G) Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
 1. Products:
 - a. BOBRICK Model No. B-26627.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- E. Mirror: Stainless steel framed (D), 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
 1. Shelf: Stainless steel; gage and finish to match mirror frame, turned down edges, welded to frame; 5 inches (125 mm) deep, full width of mirror.

2. Products:
 - a. Bradley Channel-Frame Mirror/Shelf Model 7815 (172nd std).
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- F. Mirror ADA: (E) Stainless steel Framed tilt mirror
 1. Products:
 - a. Bradley Fixed Tilt Mirror Model 740-2436 (172nd std)
- G. Grab Bars: (A) Stainless steel, smooth surface.
 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, concealed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Products:
 - 1) Bradley Grab Bar Series 832 (172nd std).
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
- H. Sanitary Napkin Disposal:(C) Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 1. Products:
 - a. Bradley Surface-Mounted Napkin Disposal Model 4781-11 (172nd std).
 - b. Substitutions: Section 01 60 00 - Product Requirements.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: (N) Stainless steel tube, see basis of design product below inch (____ mm) outside diameter, 0.05 inch (1.3 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.
 1. Products:
 - a. Bradley Shower Curtain Rod Model 9531 (172nd std).
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- B. Shower Curtain: (O)
 1. Material: Opaque vinyl,.014 inch (____ mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 2. Size: coordinate with shower size inches (____ mm), hemmed edges.
 3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
 4. Color: White.
 5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
 6. Products:
 - a. Bradley 9537 (172nd std).
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- C. Shower Seat - Folding: (P) Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of ____ color.
 2. Size: ADA Standards compliant.
 3. Products:

- a. Bradley B9569 (172nd std).
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- D. Soap Shelf - Wall: (Q) Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
1. Products:
 - a. Schluter Shelf - W - Pure SWS1 D7 EB Brushed Stainless Steel.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- E. Coat Hook: (L) Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products: Bobrick Surface Mounted Robe Hook - B76727
 - a. Substitutions: Section 01 60 00 - Product Requirements.

2.06 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: (M) 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
1. Products:
 - a. Bradley 9633, 4 Hooks/3 Holders (172nd std).
 - b. Substitutions: 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as correct, and that all required support blocking is installed..

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 1. Grab Bars: As indicated on drawings.
 2. Mirrors: As indicated on drawings
 3. Other Accessories: As indicated on drawings.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. Larsen's Manufacturing Co..
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Larsen's Manufacturing Co; _____: www.larsensmfg.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound (4.54 kg).
 - 3. Finish: Baked polyester powder coat, _____ color.

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
 - 1. Formed stainless steel sheet; 0.036 inch (0.9 mm) thick base metal.
- B. Cabinet Configuration: semi recessed type.
 - 1. At 8" CMU: Recessed Cabinets shall be Occult Series SS-O-2409 solid door with black die-cut letters with Type A lettering style, as manufactured by Larsen's Manufacturing Company or approved equal. All Fire Extinguisher Cabinets shall comply with the Americans with Disabilities Act. (ADA)
 - 2. At other walls: Semi-Recessed Cabinets shall be Occult Series SS-3612-RL solid door with black die-cut letters with Type A lettering style, as manufactured by Larsen's Manufacturing Company or approved equal. All Fire Extinguisher Cabinets shall comply with the Americans with Disabilities Act. (ADA)

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, at height indicated in drawings.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets in locations shown on the Drawings.

END OF SECTION

SECTION 10 51 26 PLASTIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic lockers.
- B. Locker benches.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and nailers.

1.03 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- D. Samples: Submit two samples 3 by 3 inches (___ by ___ mm) in size, of each color selected.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum [5] years experience in manufacture of solid plastic lockers with products in satisfactory use under similar service conditions.
- B. Installer Qualifications: Minimum [5] years experience in work of this Section.

1.07 WARRANTIES

- A. Provide manufacturer's 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Plastic Lockers: Basis of Design
 1. Scranton Products; Tuff Tec: www.scrantonproducts.com/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER APPLICATIONS

- A. Wardrobe Lockers (at Restrooms): Solid plastic lockers, wall mounted with matching closed base.
 1. High impact, high density polyethylene (HDPE) formed under high pressure into solid plastic components with homogeneous color throughout, with smooth orange peel finish.
 2. Width: 12 inches (305 mm).
 3. Depth: 18 inches (457 mm).
 4. Height: 60 inches (___ m).

5. Locker Configuration: Z-tier (2 lockers each with a short and long compartment).
 6. Fittings: Size and configuration as indicated on drawings.
 7. Ventilation: Full Lattice Mesh.
 8. Locking: Padlock hasps, for padlocks provided by Owner.
 9. Anchor to wall.
- B. Locker Benches: Stationary type; bench top of solid high density polyethylene (HDPE); aluminum pedestal pedestals.
1. Height: 16 inch (_____ mm).
 2. Length: 30 inch (_____ mm).
 3. Depth: 9.5 inch.
- C. Locker Bench Support Brackets: Welded structural aluminum single arm floor mount pedestal bench support brackets; pre-drilled for bench top material attachment and for wall anchorage.

2.03 SOLID PLASTIC LOCKERS

- A. Lockers: Factory assembled, made of solid plastic panels, tested in accordance with NFPA 286, homogenous color throughout.
1. Doors: Full overlay without frame.
 2. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
 3. Provide filler strips where indicated, securely attached to lockers.
 4. Door Color: To be selected by Architect from standard colors.
 5. Body Color: To be selected by Architect from standard colors.
- B. Component Thicknesses:
1. Doors: 1/2 inch (13 mm) minimum thickness.
 2. Locker Body: Tops, bottoms, backs, and shelves 3/8 inch (10 mm) minimum.
 3. Sloped Tops: 1/2 inch (13 mm) minimum thickness.
- C. Hinges: Heavy duty extruded aluminum, Full height of locker, assembled into locker door and front.
- D. Coat Hooks: High impact plastic. Two prong, one per door opening.
- E. Locker Base: Solid plastic base, 4 inches (102 mm) high, field assembled.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds (445 N).
- E. Install end panels, filler panels, and sloped tops.
- F. Install fittings if not factory installed.
- G. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 11 13 13 LOADING DOCK BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Loading dock bumpers of reinforced rubber pads with attachment frame.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Placement of loading dock bumper frame anchors into concrete.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on unit dimensions, method of anchorage, and details of construction.
- C. Manufacturer's Installation Instructions: Submit installation requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Loading Dock Bumpers:
 - 1. Blue Giant Equipment Corporation: www.bluegiant.com/#sle.
 - 2. Chalfant Sewing Fabricators, Inc: www.chalfantusa.com/#sle.
 - 3. Durable Corp: www.durablecorp.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Loading Dock Bumpers: Fabric reinforced rubber pads, ozone resistant, laminated and compressed in position using two galvanized steel rods with threaded ends, washers, and nuts between 3 inch high by 2-1/2 inch wide by 1/4 inch thick (76 mm high by 64 mm wide by 6.4 mm thick) galvanized steel angle end plates.
 - 1. Projection From Wall: 4-1/2 inches (115 mm).
 - 2. Vertical Height: 10 inches (254 mm).
 - 3. Width: 24 inches (610 mm).
 - 4. Profile: Rectangular.
- B. Attachment Hardware: 3/4 inches (19 mm) diameter galvanized bolts with expansion shields.
- C. Touch-up Primer: Zinc rich type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that anchor placement is acceptable.

3.02 INSTALLATION

- A. Install dock bumpers in accordance with manufacturer's instructions.
- B. Set plumb and level.

END OF SECTION

SECTION 11 13 19.13 DOCK LEVELERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prefabricated steel dock leveler with guard rails.
- B. Hydraulic operating hardware.
- C. Mechanical vehicle restraint safety lock.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Placement of leveler frame and safety lock frame into concrete loading dock.
- B. Section 03 30 00 - Cast-in-Place Concrete: Concrete pit.
- C. Section 11 13 13 - Loading Dock Bumpers.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide materials and finish, installation details, roughing-in measurements, and operation of unit and safety lock device.
- C. Shop Drawings: Indicate required opening dimensions and tolerances, placement dimensions of safety lock device, and perimeter conditions of construction.
- D. Manufacturer's Installation Instructions: Indicate special requirements.
- E. Manufacturer's Qualification Statement.
- F. Operation Data: Provide operating instructions, and identify unit limitations.
- G. Maintenance Data: Provide unit maintenance information, lubrication cycles, and provide spare parts manual.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer agrees to correct defective work within two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Loading Dock Levelers:
 - 1. Blue Giant Equipment Corporation: www.bluegiant.com/#sle.
 - 2. Kelly Company: www.kelleycompany.com/#sle.
 - 3. McGuire MP 66 Series: www.wbmcmguire.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Loading Dock Leveler:
 - 1. Operation: Hydraulic.
 - 2. Deck Width: 72 inch (____ mm).
 - 3. Deck Length: 72 inch (____ mm).

4. Capacity: 25,000 lbs (____ kgs).
- B. Vehicle Restraint: Mechanical lock, fabricated and welded steel plate construction, spring loaded to automatically latch when activated, to comply with ICC-ES (Evaluation Service) reports for semitrailer vehicle bumper requirements for dimension and placement indicated.
- C. Deck: 1/4 inch (6.4 mm) steel checker plate deck, reinforced on underside, welded to fabricated steel frame; counter balanced with 16 inches (406 mm) long automatically operated plate lip; lip to lock in downward vertical position when leveler is at rest at dock level.

2.03 FINISHES

- A. Leveler Platform: Galvanized.
- B. Leveler Frame: Galvanized.
- C. Guard Railing: Galvanized.
- D. Pit Frame: Galvanized.
- E. Vehicle Restraint: Yellow painted hook, galvanized steel operating mechanism.
- F. Provide galvanized finish at minimum of 1.25 oz/sq ft (380 grams/sq m).

2.04 ACCESSORIES

- A. Loading Dock Bumpers: Refer to Section 11 13 13.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough-in openings are acceptable.

3.02 INSTALLATION

- A. Install dock leveler and vehicle restraint unit in prepared opening in accordance with manufacturer's instructions.
- B. Set square and level.
- C. Anchor unit securely, flush with dock; weld back of leveling dock to pit frame, and touch-up welds with primer.
- D. Anchor safety lock securely and flush with vertical dock face.

3.03 ADJUSTING

- A. Adjust installed unit and safety device for smooth and balanced operation.

END OF SECTION

**SECTION 12 24 00
WINDOW SHADES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.
- D. UL (GGG) - GREENGUARD Gold Certified Products; current listings at <http://http://productguide.ulenvironment.com/QuickSearch.aspx>.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
- B. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
 - 1. Motorized Shades: Include power requirements and standard wiring diagrams for specified products.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
 - 1. Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.
- D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.
- E. Selection Samples: Include fabric samples in full range of available colors and patterns.

1. Motorized Shades: Include finish selections for controls.
- F. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.
- G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 1. Shade Hardware: 1 years.
 2. Electric Motors: One year.
 3. Electronic Control Equipment: One year.
 4. Fabric: 10 years.
 5. Aluminum and Steel Coatings: 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
 2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.
 3. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

- A. General:
 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 2. Provide shade system that operates smoothly when shades are raised or lowered.
 3. Provide roller shades for all exterior and interior windows in the administrative area of the building. No shades are required in the warehouse spaces.
- B. Roller Shades _____ - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
 1. Description: Single roller, manually operated fabric window shades.
 - a. Drop Position: Regular roll.

- b. Mounting: Window jamb mounted.
- c. Size: As indicated on drawings.
- d. Fabric: Eurotwill 6000 - 3% open - Color 6018 Stone
2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Steel, 1/8 inch (3 mm) thick.
3. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 - d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
 - b. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.
 - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound (43 kg) minimum breaking strength. Provide upper and lower limit stops.
 - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
7. Accessories:
 - a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; baked enamel finish.
 - 1) Color: Color to be selected by Architect from standard colors.
 - 2) Profile: Square.
 - 3) Configuration: Captured and continuous, as indicated on drawings.

2.03 SHADE FABRIC

- A. Fabric - Type 1: Solar Shade - Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 1. Manufacturers:
 - a. MechoShade Systems LLC; Soho - 1600 Series (3% open):
www.mechoshade.com/#sle.
 - b. Eurotwill 6000.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Material: Vinyl coated polyester.
 3. Material Certificates and Product Disclosures:
 - a. Low-Emitting Material Certification: Greenguard Gold certified and listed in UL (GGG).
 4. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large and small tests.
 5. Color: As selected by Architect from manufacturer's full range of colors.

6. Fabrication:
 - a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

2.04 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.
- D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.06 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 12 31 00
MANUFACTURED METAL CASEWORK

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Manufactured standard and custom casework, with cabinet hardware.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and nailers for anchoring casework.
- B. Section 06 61 16 - SOLID SURFACE.

1.03 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Component dimensions, configurations, construction details, joint details, and attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
- C. Shop Drawings: Indicate casework types, sizes, locations, using large scale plans, elevations, cross sections. Include rough-in and anchors, placement dimensions and tolerances, clearances required, and keying information.
- D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches (51 mm by 75 mm).

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section during handling and installation, including finished surfaces and hardware items. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Accept casework on site. Inspect on arrival for damage.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration or lack of finish integrity.
 - 3. Cracking or peeling of finish.
 - 4. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Casework:
 - 1. Basis of Design: Laboratory Grade Casework by Onepointe Solutions, www.onepointesolutions.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.
 - 1. Style: Flush overlay - square edge.
 - 2. Primary Cabinet Material: Cold-rolled steel and Stainless steel.
 - 3. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with the following front-to-back dimensions:
 - a. Base Cabinets: 24 inches (610 mm).
 - b. Wall Cabinets: 16 inches (406 mm).
 - 4. Steel Sheet Metal:
 - a. Gables, Front and Back Panels, Gusset Plates, Aprons, and Rails: 16 gage, ___ inch (___ mm) minimum thickness.
 - b. Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gage, 0.0359 inch (0.91 mm) minimum thickness.
 - c. Backing Sheet to Door and Door Fronts: 18 gage, ___ inch (___ mm) minimum thickness.
 - 5. Structural Performance: Provide components that safely support the following minimum loads, without deformation or damage:
 - a. Base Units: 500 pounds per linear foot (744 kg/linear m) across the cabinet ends.
 - 6. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
 - 7. Shelf Edges: Turned down 3/4 inch (19 mm) on each side and returned 3/4 inch (19 mm) front and back.
 - 8. Ends: Close open ends with matching construction.
 - 9. Welding: Electric spot welded; joints ground smooth and flush.
 - 10. Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware.
 - a. Fill with sound-deadening core.
 - 11. Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials, and to separate dissimilar metals.
 - 12. Countertops: See Section 06 61 16 - SOLID SURFACE.

2.03 CABINET HARDWARE

- A. Manufacturer's standard types, styles and finishes.

2.04 MATERIALS

- A. General: Manufacturer's standard materials for units specified, unless otherwise indicated.
- B. Stainless Steel Sheet: ASTM A666 Type 304.

2.05 FINISHES

- A. Stainless Steel: No. 4 finish.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Set casework items plumb and square, securely anchored to building structure, with no distortion.
 - 1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions require more than 3/4 inch (19 mm) leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

3.02 CLEANING

- A. Clean casework, counters, shelves, glass, legs, hardware, fittings and fixtures.

3.03 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

SECTION 21 13 00**FIRE PROTECTION SYSTEM****PART 1 - GENERAL****1-01 SCOPE**

- A. The work under this section shall include furnishing and installing all materials for the complete installation of the following:

Wet Pipe Sprinkler System
 Connections to Fire Alarm System
 Fire Pump

and shall apply to all phases of work specified, shown on the drawings or reasonably required to provide for the complete installation of approved fire protection systems for the project. This structure is classed as fully sprinklered.

- B. Fire protection system shall be in accordance with the following industry standards:

AWWA C110	Ductile Iron and Gray Iron Fittings, 3 inch thru 48 inch, for Water and other Liquids
AWWA C151	Ductile Iron Pipe, Centrifugally Cast, for Water and other Liquids
AWWA C651	Disinfecting Water Mains
NFPA 13	Installation of Sprinkler Systems
NFPA 24	Installation of Private Fire Service Mains and Their Appurtenances
NFPA 70	National Electrical Code
IBC	International Building Code
UL FPED	Fire Protection Equipment Directory
UL 262	Gate Valves for Fire-Protection Service
UL 789	Indicator Posts for Fire-Protection Service
UFC 3-600-01	Fire Protection Engineering for Facilities

1-02 GENERAL

- A. The contractor for the fire protection installation shall be a NICET III Certified, qualified Fire Protection Contractor, and regularly engaged in the installation of Automatic Fire Sprinkler Systems and other Fire Protection Equipment.
- B. All materials, equipment valves and devices installed and/or furnished under this section shall be listed and/or approved for use in the fire protection installation by the authorities, agencies, codes and standards named in this section of the specifications.
- C. Refer to: Underwriters' Laboratories Approved Fire Protection Equipment List.
- D. Any permits for the installation or construction of any of the work included in this section which are required by any of the authorities and/or agencies having jurisdiction shall be obtained and paid for by the Fire Protection Contractor.

- E. This project shall be installed to meet UFC 3-600-01, Fire Protection Engineering for Facilities. Where this specification or NFPA 13 conflicts with UFC 3-600-01 the UFC 3-600-01 shall prevail.

1-03 SYSTEM DESIGN

- A. Design automatic wet pipe sprinkler system in accordance with the required and advisory provisions of NFPA 13 and UFC 3-600-01 (where conflicts arise between NFPA 13 and UFC 3-600-1 the UFC-3-600-1 shall prevail), by hydraulic calculations for uniform distribution of water over the design area. The fire protection system for this building shall be classified generally as Light Hazard, except for mechanical and storage rooms. The warehouse area shall be ESFR designed for Class I through Class IV commodities and Group A plastics. Pipe sizes shall be determined by hydraulic calculation.

1-04 GUARANTEE

- A. The entire fire protection installation, as specified under this section of the specifications, shall be guaranteed for one (1) year against defective equipment, materials and workmanship. The guarantee period is to begin on the date of acceptance of the project by the Owner.
- B. The guarantee shall not be construed as requiring the Fire Protection Contractor to render service or maintenance required in the normal operation of the equipment, or to make repairs that may be needed due to normal wear and tear or the Owner's negligence, abuse, or breakage.

1-05 INSPECTIONS AND TESTS

- A. All inspections, examinations and tests required by the authorities and/or agencies specified shall be arranged and paid for by the Fire Protection Contractor, as necessary to obtain complete and final acceptance of the Fire Protection System. The Fire Protection Contractor shall deliver certificates of all such inspections to the Project Engineer

1-06 EXISTING MAIN PRESSURES AT SITE

- A. 70 psi static, the flow was 1250 gpm at 62 psi. Contractor shall perform new flow test to verify.
- B. The actual locations of mains, branch mains and sprinkler heads should be coordinated with other trades and shall meet all Code requirements.
- C. The locations shown for items such as standpipes with hose valves, control valves, zone boundaries, etc., have been coordinated with the architectural and mechanical requirements, any deviations from the locations shown for this equipment should be verified.

1-07 SUBMITTALS

- A. Hydraulic calculations

B. Manufacturer's Catalog Data

1. Pipe and fittings
2. Alarm valves
3. Valves, including gate, check and globe
4. Water motor alarms
5. Sprinkler heads
6. Pipe hangers and supports
7. Pressure or flow switch
8. Fire department connections
9. Mechanical couplings
10. Fire pump
11. Jockey Pump

C. Shop drawings

1. Sprinkler heads and piping system layout
2. Electrical wiring diagrams
 - a. Sprinkler Heads and Piping System Layout: Prepare 30- by 42-inch or 24- by 36-inch detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)." Show data essential for proper installation of each system. Show details, plan view, elevations, and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams. These drawings shall have reviewed, approved and stamped by the appropriate fire department prior to submission to Engineer.

1-08 SPRINKLER RISERS

- A. Riser(s) to sprinkler system shall contain electric alarm which operates on either DC or AC when activated by water flow indicator. Water flow indicators shall be approved paddle type water flow alarm switch, instantaneously recycling with pneumatic retard with double set of contacts each rated at 15 amps 120 volt AC or .5 amps 120 volt DC. Switches shall be fully compatible with fire alarm system.
- B. A standard installation of automatic sprinklers arranged as a wet pipe system should be installed as required by the computerized hydraulic analysis.
- C. Connection to the water supply system shall be made where indicated on the drawings.
- D. The water piping, valving, sprinkling equipment and hose connections shall be installed complete in all respects.
- E. Fire pump shall be as shown on drawings.

PART 2 – PRODUCTS (all materials shall be of domestic manufacture)

- 2-01 ABOVEGROUND PIPING SYSTEMS: Provide fittings for changes in direction of piping and for connections. Make changes in piping sizes through tapered reducing pipe fittings; bushings will not

be permitted. Perform welding in the shop; field welding will not be permitted. Conceal piping in areas with suspended ceiling and exposed in mechanical room.

- A. Sprinkler Pipe and Fittings: NFPA 13, except as modified herein. Steel piping shall be Schedule 40/10 for sizes less than 8 inches. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Fittings shall be UL FPED listed for use in wet pipe sprinkler systems. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30 shall not be threaded. Side outlet tees using rubber gasket fittings shall not be permitted.
- B. Sprinkler Heads: Provide nominal 0.50-inch or 0.53-inch orifice sprinkler heads. Release element of each head shall be of the intermediate temperature rating or higher as suitable for the specific application. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings. Ceiling plates shall not be more than 0.5 inch deep. Ceiling cups shall not be permitted. Provide upright sprinkler heads in spaces with no ceilings. ESFR heads shall be 25.2 nominal K-Factor with 40 PSI minimum operating pressure.
- C. Cabinet: Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. The number and types of extra sprinkler heads shall be as specified in NFPA 13.
- D. Alarm Valves: Provide variable pressure type alarm valve complete with retarding chamber, alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories, and appurtenances for the proper operation of the system.

2-02 ALARMS

- A. Water Motor Alarm: Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in each corresponding sprinkler system. Mount alarms on the outside of the outer walls of each building, at a location as indicated.
- B. Fire Alarm: Provide equipment for the automatic transmittal of an alarm over the building fire alarm system and arrange to actuate by detection system and by the flow of water in each sprinkler system. Provide supervision of detection and actuation circuits.

2-03 UNDERGROUND FIRE LINE

- A. Contractor shall connect fire protection main to existing water main as indicated on Plans.
- B. Underground pipe and fittings shall be listed in:
 - 1. Underwriters' Laboratories - Approved Fire Protection Equipment List and shall be in accordance with AWWA C151.

- C. Underground pipe shall be PVC AWWA C900 type, as required by the authorities having jurisdiction.
- D. Underground fittings shall have joints and pressure class rating compatible with the pipe used.
- E. All underground piping for fire mains shall be installed, clamped and anchored, flushed, and hydrostatically tested.
- F. Where the underground supplies are exposed on the exterior of the building install 1" of fiberglass insulation with aluminum jacket.

2-04 PROTECTION OF EXISTING UTILITIES

- A. Existing utilities that are shown on the drawings or locations of which is made known prior to excavation shall be protected from damage during the excavation and backfilling of trenches, and if damaged, shall be repaired promptly by the Contractor at his expense.
- B. Any existing utility that is not shown on the drawings or the location of which is not known in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired promptly by the Contractor. In any event, repair shall be made under the supervision of the utility concerned.

2-05 REPAIR OF PAVEMENT, DRIVES AND SIDEWALKS

- A. Where necessary to cut pavements, drives, sidewalks, or other permanent surfaces, the cuts shall be made with neat lines and a minimum width of one foot greater than the width of the trench. Cut material shall be disposed of by the Contractor.
- B. The surfaces that are cut shall be restored to a condition at least equivalent to the condition existing before the cut was made.
- C. Concrete shall be finished to match surrounding surfaces as neatly as possible. Concrete for repair work shall be as specified hereinbefore.

2-06 FIRE DEPARTMENT HOSE CONNECTIONS

- A. The fire department hose connection shall be provided. Threads on connection shall match base fire department threads.
- B. Connection shall be plain finished with "AUTO SPKR" branded on top.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings. Keep the interior and ends of new piping and existing piping affected by Con

tractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position.

- B. Electrical Work: Provide electrical work associated with this section under Division 26-28, except for control and fire alarm wiring. Provide fire alarm system control and fire alarm wiring, including connections to fire alarm systems, in accordance with NFPA 70. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.
- C. Disinfection: Disinfect the new water piping affected by Contractor's operations in accordance with AWWA C651. Exercise caution when mixing chlorine disinfectant solutions. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit results prior to new water piping being placed into service. Disinfection of system supplied by nonpotable water is not required.
- D. Connections to Existing Water Supply Systems: Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around the main piping; bolt valve to the branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Engineer in writing at least 15 days prior to connection date; receive approval before any service is interrupted. Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labor as required. Furnish the labor and the tapping or drilling machine for making the actual connections to existing systems. Please note that the existing water supply line is transite pipe. If tapping or drilling is not possible, the contractor shall provide a transition fitting.
- E. Tests: Hydrostatically test each system at 200 psig for a 2-hour period with no leakage or reduction in pressure. Flush piping with potable water in accordance with NFPA 13. Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. When tests have been completed and corrections made, submit a signed and dated certificate, similar to the specified in NFPA 13.
- F. Guarantee: The entire fire protection installation, as specified under this section of the specifications, shall be guaranteed for one (1) year against defective equipment, materials and workmanship. The guarantee period is to begin on the date of acceptance of the project by the Owner.
- G. The guarantee shall not be construed as requiring the Fire Protection Contractor to render service or maintenance required in the normal operation of the equipment, or to make repairs that may be needed due to normal wear and tear or the Owner's

negligence, abuse, or breakage.

END OF SECTION

SECTION 22 05 00**BASIC MECHANICAL REQUIREMENTS****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor, etc., required to complete installation specified herein and/or shown or scheduled on Plans.

1-02 EXCAVATION, TRENCHING AND BACKFILLING

- A. Excavate trenches for underground pipe lines to required depth and provide a separate trench for each utility sewer and water line except where otherwise noted on drawings. Lay all pipe in open trench unless noted otherwise on plans. Water lines shall be installed with a minimum of 24" cover unless otherwise approved by the Engineer.
- B. After piping has been tested, inspected and approved by the Engineer, and prior to backfilling, remove forms and clean excavation of trash and debris.

1-03 GENERAL PIPING INSTALLATIONS

- A. Arrange and install piping approximately as indicated, straight, plumb and as direct as possible; form right angles or parallel lines with building walls. Keep pipes close to walls, partitions, ceilings, offset only where necessary to follow walls as directed. Locate groups of pipes parallel to each other; space them at distance to permit applying full insulation and to permit access for servicing valves. The Engineer reserves the right to require this Contractor to make minor changes in pipe locations where conflicts occur with other trades or equipment. Such changes shall be made without extra cost to the Owner.
- B. Install horizontal piping as high as possible without sags or humps. Grade drainage piping at uniform slope of 1/4 inch per foot minimum. Where this is impossible, maintain slope as directed, but in no case less than 1/8 inch per foot.
- C. Locate valves for easy access and operation. Where concealed, provide access doors. Do not locate any valves with stems below horizontal.
- D. Provide water supply, drain, vent and gas connections to equipment specified in other Sections, requiring such services. Indicated locations and sizes of piping, valves, shall conform to approved shop drawings and printed installation directions furnished by equipment manufacturer. Connection sizes shall not be smaller than equipment outlets.
- E. Provide flanges or unions as applicable at all equipment connections. For steel and wrought iron pipe, use malleable iron unions 150 psi for standard pipe and 250 psi for extra heavy, with bronze to iron ground joints; cast iron flanged unions to be gasket type.
- F. Sufficient space shall be allowed in erecting piping for proper application of thermal insulations including fittings. In no case shall any insulation be cut or reduced in thickness because of inadequate space.

- G. If any piping is found installed without being reamed, cleaned, deburred, etc. or in any way contrary to above, it shall be sufficient reason for related erected piping to be removed, inspected by the Engineer, corrected and reinstalled, all at contractor's expense.
 - H. All piping to be of domestic (United States) manufacture and so certified by the Contractor.
 - I. In the installation of all pipe runs where shown or where necessary, install expansion joints as specified or as necessary to allow for expansion. Broken pipe or fittings due to rigid connections must be removed and replaced at no additional cost to the Owner.
 - J. All lines shall be securely anchored where required. Where such anchors occur, they shall be securely fastened to the structure of the building in a manner approved by the Engineer. Drawings shall be submitted before installation.
 - K. Exposed piping passing through walls, floors and ceilings, shall be fitted with escutcheons. Inside diameter shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve.
- 1-04 FLASHING
- A. Vent pipes passing through roof shall be flashed with 4 pounds lead sheet, at least 20 inches square shall be extended up and turned down inside pipe with pipe at least 12 inches above roof at center line. Vents shall off-set in roof joist area if necessary so that no vent shall be closer than 4 feet from outside wall line.
- 1-05 BURIED PIPING
- A. Provide detectable metal core plastic backed tape manufactured specifically for warning and identification of buried piping over all exterior piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 2 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be "CAUTION BURIED OIL PIPING BELOW" or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3-01 WORKMANSHIP, MATERIALS AND EQUIPMENT

- A. All work shall be performed in a workmanlike manner and shall present a neat and mechanical appearance when completed. All materials shall be of type, quality and minimum rating prescribed therein or indicated on the Plans.

3-02 PROTECTION OF WORK

- A. This CONTRACTOR shall protect his work at all times from danger by freezing, breakage, dirt, foreign materials, etc., and shall replace all work so damaged. The CONTRACTOR shall use every precaution to protect the work of others, and he will be held responsible for all damage to other work caused by his work or through the neglect of his workmen.

END OF SECTION

SECTION 22 05 23**VALVES****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor, etc., required to complete installation as specified herein and/or shown or scheduled on plans.
- B. This section includes the installation of all valves.
- C. Valves shall be in accordance with the following industry standards:
- | | |
|-----------|---|
| MSS SP-69 | Pipe Hangers and Supports - Selection and Application |
| MSS SP-72 | Ball Valves with Flanged or Butt-Welding Ends for General Service |
| MSS SP-80 | Bronze Gate, Globe, Angle and Check Valves |
| MSS SP-83 | Steel Pipe Unions Socket-Welding and Threaded |
- D. Submittals
1. Provide submittal data showing product is in compliance with these specifications and the referenced industry standards.
 2. Valves shall have name or trademark of manufacturer and working pressure cast or stamped on valve body.
 3. Valve handwheels shall be oriented when installed to provide maximum accessibility for operation.
 4. Valve discs shall be the manufacturer's standard material for the service in which the valve is used unless otherwise indicated under the individual type valve specification.
 5. Each valve in the following indicated piping systems, shall have valve tag, minimum 1-1/4" size, 18 gauge brass, affixed assigning a number to the valve, except valve tags are not required on steam trap assemblies. Designation numbers shall be stamped in tags. Tags shall be as follows:

<u>System</u>	<u>Tag Shape</u>	<u>Typical Designations</u>
Natural Gas	Octagonal	NG-1, NG-2

 Brass tags shall be attached to valves with nylon self-locking cable ties. A valve chart framed under glass and wall mounted shall be provided, which shall list each valve by number, its location in the piping system (including pipe line such as CH or CHR, and associated piece of equipment such as pump or chiller), and its function (shut-off, balancing, drain or quick-fill). Valve chart shall be mounted in the Mechanical Room or where directed by Engineer.

PART 2 - PRODUCTS

2-01 Provide full port ball valves for the following piping systems:

- A. Domestic water
1. Ball valves two inches (2") diameter or less:
 - a. Nibco S-850 or T-580 or equal

2-02 Provide check valves for the following systems:

- A. Domestic water
 - 1. Swing check type, 2 inch diameter or less:
 - a. Valves shall be bronze, swing type in accordance with MIL-V-18436. Valves shall be rated for 125# SWP. Valves shall be:
Nibco S-413-Bq Stockham B-309
Milwaukee 1509 Crane 1342

2-03 Valves for Natural Gas System

- A. Plug Valves. Valves shall be iron-body (semi-steel) lubricated, with teflon coated plug. Flanged valves shall be installed between 150# ASA steel flat faced slip-on weld flanges. Valves over 1" size shall be wrench operated and wrench shall be furnished with each size valve. Each plug valve shall be serviced with the sealant recommended by the valve manufacturer.
 - 1. Valves 2" and smaller shall be short-pattern type with threaded end connections. Valves shall be rated at 175# WOG. Valves shall be:
Nordstrom Fig. 142 Walworth No. 655
Powell No. 2200

2-04 Copper Pipe

- A. Models indicated in this Section are for steel pipe. If copper service is indicated, Contractor shall supply a valve of the same type specified, but for copper pipe.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Valves shall be installed in accordance with manufacturer's recommendations.
- B. Install at equipment and as indicated on drawings to allow maintenance or isolation, and to establish proper and sequential operation of complete system. Shell and tube liquid coolers shall have fluid valves installed so that tubes are accessible for cleaning or replacing. Provide globe valves or plug cocks where required to regulate flow to obtain equal distribution of gas or fluid handled. Remove valve bonnets, where valve construction permits removal, when connecting valves by brazing to copper tubing. Install globe and angle valves with stems horizontal where necessary to avoid trapping of fluid.

END OF SECTION

SECTION 22 05 29**MECHANICAL SUPPORTING DEVICES****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide supporting devices for mechanical systems as described herein.
- B. Isolators shall be in accordance with the following industry standards:
 - ASTM D 2240 Rubber Property - Durometer Hardness
 - ARI 370 Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment
 - ARI 575 Measuring Machinery Sound Within an Equipment Space
- C. Submittals
 - 1. Provide submittal data showing product is in compliance with these specifications and the referenced industry standards.

1-02 PIPE HANGERS

- A. All horizontal pipe are to be supported by adjustable hangers supported below structure. Use Fee and Mason 239, Grinnell, or Midland-Ross. Use Fee and Mason Figure 81, Grinnell or Midland-Ross protectors on all insulated pipe and install hangers on outside of insulation.
- B. Where piping is grouped in parallel horizontal runs at same elevation, or as otherwise noted on plans, bar-type supports may be used using Fee and Mason Figure 8005, Grinnell, or Midland-Ross hangers or Unistrut channels.
- C. All vertical risers shall be supported at the floor by Fee and Mason Figure 241, Grinnell, or Midland-Ross riser clamps in addition to adequate base supports.
- D. Hangers are to be installed not more than ten feet (10') apart on 1-1/2 inch and larger pipe and not more than eight feet (8') apart on pipe smaller than 1-1/2 inches.

1-03 FOUNDATIONS AND EQUIPMENT SUPPORTS

- A. This Contractor shall provide suitable foundations and supports, as indicated on drawings, specified herein, or as required to make a neat, substantial and workmanlike job. All foundations, supports, stands, etc., shall be approved by the Architect/Engineer prior to construction.

PART 2 - PRODUCTS

2-01 GENERAL

- A. All electrical connections, drain connections, piping connections, etc., made to equipment which resets on vibration isolators, shall be sufficiently flexible to permit the equipment to be properly isolated.
- B. Submittal data on vibration isolators shall be included with submittal data on each piece of

equipment.

2-02 FLEXIBLE CONNECTIONS

- A. Flexible connections shall be installed on each piece of equipment as indicated on Plans.
- B. Flexible connections shall be of the metallic type. Metal hose shall be Grade E phosphor bronze, monel or stainless steel corrugated tube covered with comparable bronze or stainless braid restraining and pressure cover. Stainless steel grades shall be 304, 316 or 321 as required for the application. Length of flexible metal hose shall be not less than that recommended by the manufacturer for continuous vibration application.
- C. Flexible connections shall be installed in accordance with the manufacturer's recommendations, including placement in the pipe line without damage, misalignment or change in its normal length. Prior to filling the system, the alignment and length shall be checked by loosening the flange bolts to determine the installation conditions. The piping installation shall be corrected if necessary and the flexible hose replaced if damaged. As Vibration Mounting and Controls, Inc., Type MFE.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Support equipment as specified herein.
- B. Provide isolators for equipment and piping systems as specified herein.
- C. Install isolators, materials and equipment as per manufacturer's directions.

END OF SECTION

SECTION 22 10 00**PIPE AND FITTINGS****PART 1 - GENERAL****1-0.1 SCOPE**

- A. Provide all material, equipment and labor, etc., required to complete installation specified and/or shown or scheduled on plans.
- B. Piping shall be in accordance with the following standards:
- | | |
|------------------|---|
| ANSI B16.18 | Cast Copper Alloy Solder Joint Pressure Fitting |
| ANSI B16.22 | Wrought Copper and Copper Alloy Solder Joint Pressure Fitting |
| ANSI B16.24 | Cast Copper Alloy Pipe Flanges and Flanged Fittings |
| ANSI B31.5 | Refrigeration Piping Errata |
| ASME/ANSI B16.5 | Pipe Fitting and Pipe Flanges |
| ASME/ANSI B16.9 | Factory Made Wrought Steel Butt Welding Fittings |
| ASME/ANSI B16.11 | Forged Fittings, Socket Welded and Threaded |
| ASME/ANSI B16.26 | Cast Copper Alloy Fittings for Flared Copper Tubes |
| ASTM B 32 | Solder Metal |
| ASTM B 42 | Seamless Copper Pipe, Standard Sizes |
| ASTM B 88 | Seamless Copper Water Tube |
| ASTM D1784 | Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds |
| ASTM D2412 | Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading |
| ASTM D2665 | Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings |
| ASTM D3034 | Standard Specification for Type PSM Poly (Vinyl Chloride) PVC Sewer Pipe and Fittings |
| ASTM F477 | Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe |
| AWS A5.8 | Filler Metals for Brazing |
| ANSI A13.1 | Scheme for the Identification of Piping Systems |
| IPC | International Plumbing Code |

1-02 WORK INCLUDED

- A. Pipes, fittings, unions, couplings, flanges, gaskets, and other materials and instructions for the following piping systems.
1. Sanitary waste, vent piping, and storm drain piping.
 2. Domestic water piping.
 3. Natural gas piping.
 4. Equipment drains.

1-03 SUBMITTALS

- A. Provide submittal data showing product is in compliance with these specifications and the referenced industry standards.

- 1-04 All piping installed on this project shall be new and of full weight and size shown and of proper specification for service intended. Only domestic pipe may be used. When piping is cut, it shall be reamed with pipe reamer and all burrs, scale, trash and foreign matter removed. Where non-ferrous piping connects to ferrous piping, install EPCO dielectric couplings.
- 1-05 Where piping is threaded, dies shall be clean and sharp and joint compound shall be applied to male end only. All joints shall be made up tight. The caulking of these joints will not be tolerated. Pipe joint compound must be approved by the Engineer. Copper tubing may be cut with a tubing cutter or hacksaw with guide.

PART 2 - PRODUCTS

- 2-01 Provide the specified materials for the following piping systems:
- A. Sanitary Waste, Grease Waste, and Storm Drain Piping Below Grade and Outside Building:
 - 1. Sanitary waste below grade and outside shall be SDR 35 PVC in accordance with ASTM D3034.
 - B. Sanitary Waste, Vent Piping System, and Storm Drain Piping Inside Building:
 - 1. PVC pipe shall conform to ASTM D 3034, Schedule 40 PVC. Pipe shall be installed in accordance with ASTM D 2321.
 - 2. **Piping exposed above ceiling in return air plenum shall be service weight hubles cast iron.**
 - C. Domestic Water Piping System Outside Building:
 - 1. Domestic water piping below grade and outside of building shall be Type "K" copper in accordance with ASTM B88. Fittings shall be ANSI B16.18 or ANSI B16.22 soldered joint in accordance with SBCCI 88.
 - D. Domestic Water Piping System Inside Building:
 - 1. Domestic water piping within the building shall be Type "L" copper in accordance with ASTM B88 with ANSI B16.18 or ANSI B16.22 soldered joint fittings or with ASME/ANSI B16.26 flared joint fittings. Provide ASTM B42 copper pipe nipples with threaded end connections. Provide ASTM B32, 95-5 tin-antimony solder, or provide Plumbing Code approved lead-free solder.
 - E. Natural Gas Piping System Inside Building:
 - 1. Natural gas piping above grade and inside building shall be Schedule 40 black steel in accordance with ASTM A53. **Piping inside return air plenums or above roof shall be welded.** Pipe greater than two inches (2") diameter shall be welded. All other pipe less than two inches (2") diameter may have screwed joints.
 - F. Equipment Drain Piping:
 - 1. Equipment condensate drain shall be Schedule 40 PVC.

PART 3 - EXECUTION

- 3-01 INSTALLATION
- A. All piping installed on this project shall be new and of full weight and size shown and of proper

specification for service intended. Only domestic pipe may be used. When piping is cut, it shall be reamed with pipe reamer and all burrs, scale, trash and foreign matter removed. Where non-ferrous piping connects to ferrous piping, install EPCO dielectric couplings.

- B. Where piping is threaded, dies shall be clean and sharp and joint compound shall be applied to male end only. All joints shall be made up tight. The caulking of these joints will not be tolerated. Pipe joint compound must be approved by the Engineer. Copper tubing may be cut with a tubing cutter or hacksaw with guide.
- C. Copper tubing shall be thoroughly reamed, cleaned with steel wool or emery cloth, and a non-corrosive flux used before soldering or brazing. Where soldered joints in domestic water piping are specified, only antimony and lead free solder shall be used. Where brazed joints are specified, only copper-phosphorous alloys shall be used. Where unavoidable soldered joints occur below slab on grade, silver solder with minimum 5% silver content shall be used.
- D. Mechanically formed tee connections may be utilized on copper piping systems. Systems shall be in accordance with ASME B31, ANSI B31.5 and International Plumbing Code. System shall utilize brazed connections, rather than soldered. Brazed connections shall be in accordance with Copper Development Association recommendations.
- E. Where welding is specified or done, it shall be by electric arc by mechanics skilled in operation and holding a test certificate acceptable to the Engineer. All scale and flux shall be removed from piping after welding.

3-02 STENCILING ON PIPING

- A. All piping exposed or concealed shall have the following symbols stenciled on pipe in a visible location. Stencil shall be attached to pipe every twenty feet (20'). Stencil shall be installed after piping has been painted and/or insulated. Stencil legend shall be as follows:

<u>Service:</u>	<u>Symbol:</u>
Sanitary waste and vent	San W.
Domestic cold water	DCW
Domestic hot water	DHW
Natural Gas	Gas
Domestic hot water return	DHWR
Storm Drain	Storm Drain

- B. Install "Direction of Flow" arrow at each stencil.

3-03 Painting of Piping and/or Pipe Insulation

- A. After insulation and before stenciling, piping in the following locations shall be painted by the General Contractor with appropriate direction from the Mechanical Contractor:
 1. All piping in equipment rooms.
 2. All other exposed piping indoors.
 3. Exposed piping outdoors where aluminum jackets not required.

END OF SECTION

SECTION 22 34 00**INSTANTANEOUS HOT WATER HEATERS****PART 1 - GENERAL**

1.1 SCOPE

- A. Provide water heaters of the natural gas type described herein.
- B. Water heaters shall be in accordance with the following industry standards:
 - ANSI Z21.22 Relief Values and Automatic Gas Shut Off Devices for Hot Water Supply Systems
 - ASME BPVC SEC IV Boiler and Pressure Vessel Code: Section IV Heating Boilers
 - IPC International Plumbing Code

PART 2 - PRODUCTS

2.1 Water Heater (Instantaneous Natural Gas)

- A. The water heater(s) shall be Rheem Model RTGH or approved equal.
- B. Size and capacity shall be as shown on the drawings.
- C. Vent piping shall be 3" PVC.
- D. Unit includes a built-in electric blower to force exhaust gas to the outdoors.
- E. Unit shall include a controller with digital display showing temperature setting and maintenance codes.

PART 3 - EXECUTION

- 3.1 Water heater shall be installed in accordance with manufacturer's instructions.
- 3.2 Electrical wiring shall be installed in accordance with these specifications.

END OF SECTION

SECTION 22 42 00**PLUMBING FIXTURES, TRIM & ACCESSORIES****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor, etc., required to complete installation specified herein and/or shown or scheduled on Plans.
- B. Work Included: Plumbing fixtures, associated trim and fittings necessary to make a complete installation from wall or floor connections to rough piping, and certain accessories.
- C. Plumbing fixtures, trim and accessories shall be in accordance with the following industry standards:

ANSI A112.36.2M	Cleanouts
ASME A112.6.1M	Supports for the Off-the-floor Plumbing Fixtures - Public Use
ASME A112.18.1M	Plumbing Fixture Fittings
ASME/ANSI A112.19.1M	Enameled Cast Iron Plumbing Fixtures
ASME A112.19.2M	Vitreous China Plumbing Fixtures
ASME A112.19.5	Trim for Water-Closet Bowls, Tanks, Urinals
ASME A112.21.1M	Floor Drains
PDI WH 201	Water Hammer Arrestors
IPC	International Plumbing Code

1-02 GENERAL

- A. All fixtures must be securely fastened to the floor or walls by means of inserts or expansion bolts in concrete work, and by means of expansion bolts, toggle bolts in masonry work, and by means of framing and screws in frame construction, to the satisfaction of the Architect/Engineer. Plumber shall install fixtures in accordance with standard industry practice and manufacturer's instructions. Plumber shall seal around counter mounted fixtures to provide positive seepage protection.
- B. All plumbing fixtures shall be provided complete with all necessary trim including bolt caps, tail pieces and drains, blank off caps, etc., such that the fixtures are fully functional and aesthetically complete, whether or not all such parts are specifically listed in the specifications below. All porcelain or vitreous china fixtures (and related trim) shall be furnished in white color unless otherwise noted.

1-03 FIXTURE TRIM

- A. All plumbing fixture brass trim shall be designed so that all wearing parts are to be in a standardized renewable operating unit which can be removed without detaching the supply fixture or faucet proper. The standardized renewable operating units are to be interchangeable with all supply fixtures and faucets whether quick compression or self-closing. All exposed metal parts of all fixtures, including faucets, waste fittings, waste plugs, strainers, flush valves, traps, supplies, nipples and escutcheons shall be chrome plated brass unless other materials or finish is specified. Angle stops with S.P.S. brass nipples from wall to stops shall be provided on all water supplies to fixtures. Fixture trim must be that of the fixture manufacturer wherever

possible and must bear a permanent impression of the manufacturer. No "competitive grade" trim will be permitted. All tubular waste pipe and fittings under sinks and lavatories shall be 17 gauge chrome plated brass. All p-traps shall have cleanout plugs.

- B. SUBMITTALS: Provide submittal data showing product is in compliance with these specifications and the referenced industry standards.

PART 2 - PRODUCTS

2-01 Furnish and install all plumbing fixtures as shown on Plans. Kohler fixtures are specified, however, Crane, Eljer, or American Standard may be used if they are equal in all respects to those specified. Contractor shall submit data on trim on well as fixtures. Where Zurn flush valves are specified, equivalent Delaney models will be the only permitted substitute.

A. Cleanouts

General: Furnish all cleanouts and/or test tees as shown on Plans and required by Code. Cleanouts shall be the same size as the pipe they serve, except that 4 inches shall be the largest size required. Cleanouts shall be provided at the foot of each soil stack and of each run, change in direction, and mains, not to exceed 50 feet apart inside of building and 100 feet apart outside of building. Cleanouts shall be as manufactured by Wade, Jay R. Smith, Zurn, or Josam, and shall be as follows:

1. Inside building- Zurn Model ZN 1400 NH.

B. Water Hammer Arresters

1. All water supply piping fittings and fixtures shall be protected against water hammer, shock or surge pressure by water hammer arresters. Arresters shall incorporate metal piston. The following schedule for Zurn or Precision Plumbing Products, arresters shall apply:

<u>P.D.I. Symbol</u>	<u>Fixture Unit Ratings</u>
A	1-11
B	12-32
C	33-60

2. Fixture piping shall be adequately anchored to prevent vibration.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Fixtures, trim and accessories shall be installed in accordance with manufacturer's recommendations.

3-02 ROUGH-IN DATA:

- A. Where handicapped fixtures are indicated, the following dimensional data shall apply.
 Water Closets - Mount rim at 18" A.F.F.
 Lavatories - Mount so bottom of bowl is 2'-3" A.F.F.
 Drinking Fountain - Mount at 2'-3" to bottom of fountain.
 Urinals - Mount rim at 17" A.F.F.

END OF SECTION

SECTION 23 07 00**MECHANICAL SYSTEMS INSULATION****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor, etc., required to complete installation specified herein and/or shown or scheduled on Plans.
- B. Field applied insulation for thermal efficiency and condensation control for HVAC piping, ductwork and equipment.
- C. Industry Standards
- D. Insulation systems shall be in accordance with the following industry standards:

ASTM C 195	Mineral Fiber Thermal Insulating Cement
ASTM C 916	Adhesives for Duct Thermal Insulation
ASTM C 1136	Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM E 84	Surface Burning Characteristics of Building Materials
ASTM E 96	Water Vapor Transmission of Materials
NFPA 90A	Standard for the Installation of Air Conditioning and Ventilation Systems
NFPA 255	Surface Burning Characteristics of Building Materials
IBC	International Building Code
UL 723	Surface Burning Characteristics of Building Materials
- E. Submittals: Provide submittal data showing product is in compliance with these specifications and the referenced industry standards.

1-02 GENERAL

- A. Insulation shall include all insulating materials, their application, recanvassing after finish, bands, tie wire, and weather protection for all pipe fittings, valve and equipment as indicated and as specified herein.
- B. Insulation and insulation assemblies shall meet the requirements of International Building Code (IBC), unless more stringent requirements are listed herein.
- C. Concealed insulation shall have a flame spread of 0-75 and a smoke developed of 0-450.
- D. Exposed insulation shall have a flame spread of 0-50 and a smoke developed of 0-450.
- E. Scope of Insulation: All new piping as indicated below, or where indicated on plans, details or schematics and all existing piping as noted shall be insulated. All piping system components exposed and subject to freezing shall be insulated. This includes valves, expansion joints, orifices, etc. Where gauge cocks, orifice ports and other similar devices require access, such devices shall have extensions beyond insulation provided by mechanical contractor.
- F. If a material specified herein becomes unavailable, or if there is a question regarding the required insulating material on this job, insulator shall advise engineer BEFORE job bids for

resolution of the question.

- G. PVC jackets for insulation shall be in accordance with UL 723 and pertinent flame spread and smoke developed ratings.

PART 2 - PRODUCTS

2-01 PIPE INSULATION

A. Domestic Water Piping

- 1. All above grade domestic cold and hot water piping shall be insulated. Piping shall be insulated as follows:
 - a. One inch (1") thick heavy density UL listed fiberglass insulation with factory supplied vapor barrier jacketing. Jacketing shall have continuous pressure sealing lap adhesive for sealing of the longitudinal joint. Butt strips shall be sized to seal each circumferential joint. Jacket shall have vapor permeance not greater than 0.02 perm/in. Fittings shall be insulated with 1" precut fiberglass and molded snap on type PVC jacket cover having a 25/50 flame/smoke rating. Seal edges of snap-on cover.

B. Storm Drain Piping

- 1. Interior storm drain piping shall be insulated with one inch (1") thick heavy density UL listed fiberglass insulation with factory supplied vapor barrier jacketing. Jacketing shall have continuous pressure sealing lap adhesive for sealing of the longitudinal joint. Butt strips shall be sized to seal each circumferential joint. Jacket shall have vapor permeance not greater than 0.02 perm/in. Fittings shall be insulated with 1" precut fiberglass and molded snap on type PVC jacket cover having a 25/50 flame/smoke rating. Seal edges of snap on cover.

C. Condensate Drains

- 1. One-half inch (1/2") thick closed cell elastomeric thermal insulation. The insulation shall be pre-slit longitudinally and pressure-sensitive adhesive for closure and vapor sealing of the longitudinal joint. Insulation shall have flame spread and smoke developed rating as established by ASTM E84.

2-02 DUCT INSULATION

A. **ALL** ductwork above finished ceilings shall be insulated on the exterior as follows:

- 1. All ductwork shall be wrapped with blanket flexible mineral fiber conforming to ASTM 553, Type 1, Class B-3, 1.0 pounds per cubic foot, 2.0 inches thick.
- 2. The insulation shall be stapled in place and all joints sealed as per manufacturer's directions. A copy of said directions shall be furnished to the Engineer with shop drawings on insulation.
- 3. Duct dimensions indicated are actual metal sizes prior to installation of exterior insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All insulation shall be installed in accordance with manufacturer's written instructions.

- B. All above insulation shall be applied by a approved insulating Contractor employing trained insulating personnel.
- C. No insulation shall be applied over pipes, fittings or other surfaces which are not clean. Insulation shall be applied after pipes have been thoroughly tested and proven tight by the Mechanical Contractor.
- D. Insulation shall fit in snug contact with pipe and be installed in accordance with Manufacturer's recommendations.
- E. Stagger joints on layered insulation.
- F. Seal joints in insulation.
- G. Provide six inch long, 20 gauge galvanized steel sleeve around pipe insulation at each support.
- H. Insulate fittings with sheet insulation and as recommended by Manufacturer where no other fitting insulation is indicated above.

END OF SECTION

SECTION 23 08 00**TESTING AND BALANCING****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor required to test and balance all mechanical systems.
- B. Test and Balance Agency Credentials: Test and Balance Agency shall hold current membership in the Associated Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB). Test and Balance Agency shall have completed at least five jobs of comparable size and similarity to this project. Test and Balance Agency job list, credentials and procedures shall be submitted with shop drawings by Mechanical Contractor for approval by Engineer. Test and Balance Agency shall have at least one registered professional engineer on staff and all reports shall bear the stamp of said engineer from the state in which this job is located. Said engineer's license in this state shall be current at the time reports are sealed.
- C. Balance procedures required herein shall be accomplished in accordance with ASHRAE HVAC Applications Handbook. Requirements therein shall be as binding as though full reprinted herein. Test and Balance Agency shall be completely familiar with the requirements of the ASHRAE HVAC Applications Handbook. Requirements therein shall be as binding as though full reprinted herein. Test and Balance Agency shall be completely familiar with the requirements and shall perform each task listed therein on the required systems. As a minimum, report shall include items required by "Report and Report Information", plus information on hydronic systems necessary to determine proper conformance to design requirements, including motor design and operating amps, and system flows and pressure drops.
- D. Procedures required on this job shall be:
Air Side Balancing
Temperature Control Verification
Vibration Testing
- E. Instrumentation used by agency shall be in calibration at time of testing. Required instruments shall be as listed in Chapter 34 as a minimum. Accuracy of instruments shall conform to the following list:
- | | | |
|------------------------------|---|-------------------|
| Temperature Indicators | ± | 0.1 degrees F max |
| Air Flow Indicators | ± | 10% max |
| Differential Pressure Gauges | ± | 5% max |
| Ampere Meters | ± | 3% max |

PART 2 - BALANCING OF SYSTEMS

2-01 JOB INSPECTION

- A. Testing and Balancing Agency shall act as an authorized inspection agency, responsible to the Engineer, and shall list all items which require correction or have not been installed in accordance with contract drawings and/or specifications pertaining to heating, ventilating and air conditioning systems.
- B. The Testing and Balancing Agency shall be given access to the project site at all times and shall

not be required to make prior arrangements with the contractor for site visiting to perform any balancing work or pre-balancing inspection the Agency may require.

2-02 AIR BALANCE

- A. Actual air balancing shall not begin until all systems have been completed, placed into operation, final filters installed, and all control systems completed and calibrated.
- B. Air balance shall include performance ratings of all supply, return and exhaust fan motors. Fan speeds shall be adjusted to provide design flows, including system diversities, at actual system pressures. Any drive changes necessary to meet this requirement shall be provided by the fan manufacturer and installed by the mechanical contractor under the direct supervision of the Testing and Balancing Agency at no additional cost to the Owner.
- C. Pitot Tube traverses of all trunk lines and major branch lines shall be made to determine proper proportioning of air flows within all systems.
- D. Pressure drop readings across all major system components and significant drops within duct systems shall be reported to determine any deviation between actual and theoretical value.
- E. Accurate flow and pressure measurements shall be made at each terminal device and each supply, return, or exhaust diffuser. Flow at terminal units and outlets shall be adjusted by appropriate means to within 10% of design requirements.
- F. Outside air, return air, and supply air quantities for all systems shall be adjusted to within 10% of design requirements.

2-03 CONTROL SYSTEMS

- A. The Mechanical Contractor shall have installed and thoroughly checked the action and calibration of all control devices and placed the entire system into operation.
- B. Testing and Balancing Agency shall thoroughly re-check all control sequences, and calibration of all control devices. Mechanical Contractor shall cooperate with Testing and Balancing Agency in the re-calibration of set-point readjustment of any control device he may require.

2-04 VIBRATION TESTING

- A. Testing and Balancing Agency shall make a visual inspection of all fans and air handling units for defects which cause excessive vibration when unit is operating.
- B. Vibration isolation on equipment shall be checked for equal deflection and proper operation.
- C. Testing and Balancing Agency shall measure the vibration of each unit with a vibration meter capable of frequency and amplitude analysis, including displacement and velocity readouts. Vibration shall be checked against ASHRAE HVAC Applications Handbook. If vibration exceeds amount listed therein, mechanical contractor shall take corrective action.
- D. A complete frequency analysis shall be made in areas where vibration amplitude measurements exceed those specified, in order to determine the cause of the excessive vibration.

2-05 OWNER INSTRUCTION

- A. Testing and Balancing Agency shall provide neatly typed final reports listing results of all air balancing as well as vibration and energy projection measurements and conclusion. Final reports shall be submitted to Architect/Engineer for his approval.

PART 3 - EXECUTION

3-01 SCHEDULING

- A. Contractor shall notify Testing and Balancing Agency immediately upon receipt of contract, the approximate completion date of project.
- B. Contractor shall give two weeks prior notice to Agency for testing and balancing schedule.
- C. Contractor shall operate all equipment during each day of testing and balancing as requested by Testing and Balancing Agency.
- D. Contractor shall allow sufficient time in completion schedule for testing and balancing.

3-02 COOPERATION

- A. Cooperation among all involved parties is essential to expedite completion of final testing and balancing. Contractor shall be responsible for coordinating all jobsite meetings between testing and balancing personnel and various sub-contractors and equipment suppliers. Building will not be turned over to the owner until final testing and balancing reports have been submitted to the engineer and approved.
- B. Contractor shall furnish and install through fan manufacturer, any additional drive change recommended by Testing and Balancing Agency, at no additional cost to the Owner.
- C. Contractor shall install necessary dampers and gauge connections as recommended by Testing and Balancing Agency to achieve proper balance.
- D. Contractor shall install all final filters before final air balancing begins.
- E. Contractor shall supply to Testing and Balancing Agency one copy of approved submittal data, including accurate performance data for all submitted equipment and one copy of final mechanical drawings and approved control drawings upon receipt of contract.
- F. It is the expressed responsibility of the Testing and Balancing Agency to carry out all procedures described within these specifications in a professional manner.
- G. It is the responsibility of the Testing and Balancing Agency to locate and identify all current and potential problem areas within the scope of these specifications and to initiate action by responsible parties to remedy such problems during the testing and balancing period. Test and Balancing Agency shall fully cooperate with the owner and Engineer to alleviate problem areas by system adjustment to the full extent that the system is adjustable.
- H. Testing and Balancing Agency shall release no reports until such have been approved by the Engineer.

3-03 COMPLETION OF WORK

- A. Testing and Balancing Agency shall inform contractor as to the extent of completion of all testing and balancing requirements listed within these specifications.

3-04 ACCEPTANCE

- A. Installation shall not be considered complete until final testing and balancing reports have been submitted to consulting engineer and have been approved by him. One copy of all final reports shall be given to the Owner's representative after final approval by the Consulting Engineer.

3-05 WARRANTY

- A. Testing and Balancing Agency shall include an extended warranty of three (3) months, after submission of report during which time the engineer or owner may request a recheck or resetting of any item included in the report. Should it be found that the system has not been properly and completely balanced, the warranty period will be extended until the engineer is completely satisfied.

END OF SECTION

SECTION 23 30 00**DUCTWORK AND ACCESSORIES****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor required to complete the installation of ductwork systems shown on the drawings and specified herein.
- B. Work included: Ductwork systems shall include the following types of systems:
1. Low velocity supply, return and exhaust air systems.
 2. Flexible supply air systems.
- C. Ductwork systems shall be in accordance with the following industry standards:
- | | |
|-------------------|---|
| AMCA 500 | Louvers, Dampers and Shutters |
| AMCA 501 | Application Manual for Air Louvers |
| ASTM A 527/A 527M | Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock-Forming Quality |
| ASTM C 423 | Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method |
| ASTM E 96 | Water Vapor Transmission of Materials |
| NFPA 90A | Installation of Air Conditioning and Ventilating Systems |
| SMACNA DCS | HVAC Duct Construction Standards - Metal and Flexible |
| UL 181 | Factory-Made Air Ducts and Air Connectors |
| UL 555 | Fire Dampers |
- D. SUBMITTALS
1. Manufacturer's Catalog Data
 - a. Dampers
 - b. Flexible ducts and connectors
 - c. Diffusers, registers, and grilles
 - d. Metal ducts

PART 2 - PRODUCTS

2-01 LOW VELOCITY RECTANGULAR DUCTWORK

- A. Steel Ducts: ASTM A 527/A 527M galvanized steel sheet, lock-forming quality; coating designation G90. Construction, metal gage, hangers and supports, and reinforcements shall conform with SMACNA DCS, except that ducts with pressure classifications below 2 inch water gage that are located outside of the conditioned space shall have a seal class C. Ductwork shall be airtight and shall not vibrate or pulsate when system is in operation. Pressure sensitive tape shall not be used as a primary sealant on ductwork with pressure classifications above one inch water.
- B. All necessary allowances and provisions shall be made for beams, columns, pipes, conduits, iron work or other obstructions in the construction of the building or the work of other contractors, whether or not the same is shown on these drawings. Where necessary to avoid beams or other structural systems, piping or conduit, the Contractor shall divide or curve ductwork to avoid said

systems. Ductwork when divided shall maintain the same cross-sectional areas in accordance with the latest edition of the ASHRAE Guide.

C. Gauges of galvanized steel shall be as follows:

1. LOW PRESSURE DUCTWORK

Maximum Size <u>Inches</u>	Steel <u>Gauge</u>	<u>Bracing</u>
Up to 12"	26	S slip, drive slip, 1 inch pocket lock on 8 ft. centers
13" - 18"	24	S slip, drive slip, 2 inch pocket lock on 8 ft. centers
19" - 30"	24	S slip, 1" pocket lock on 8' centers with 1x1x1/8" angles 4' from joint.
31" - 42"	22	Longitudinal standing seam, 1" standing S cleat, bar slip, or pocket lock on 4' centers with 1x1x1/8" angles 4' from joint.
43" - 54"	22	Longitudinal standing seam inside 1-1/2" standing S
55" - 60"	20	Cleat, bar slip, pocket lock on 8' centers with 1-1/2 x 1-1/2 x 1/8" angles 4' from joint.

D. Turning vanes shall be installed at each elbow and change in direction of supply duct where shown. Turning vanes shall be a true airfoil design; smoothly rounded entry nose with extending trailing edge. Generated sound power level shall not exceed 54 dB in the third octave band at 2000 fpm duct velocity. Vane spacing shall be 2.4 inches on center across the full diagonal dimension of the elbow. Vanes shall be as manufactured by Aero/Dyne Co., High Efficiency Profile model with factory side rails, or approved equal.

E. Ductwork shall be connected to air handling devices supply return and outdoor air connections by flexible connectors. Connector shall be Dura-Dyne Type DPN or approved equal waterproof and fireproof fabric. Flexible connections shall be at least five inches (5") long and securely fastened with galvanized band iron hoops.

F. Hard Cast DT-Tape with FTA-20 adhesive shall be applied to each duct joint and point of attachment of duct hanger. Samples shall be submitted to the Engineer for approval.

2-02 LOW VELOCITY ROUND DUCTWORK

A. All necessary allowances and provisions shall be made for beams, columns, pipes, conduits, iron work or other obstructions in the construction of the building or the work of other contractors, whether or not the same is shown on these drawings. Where necessary to avoid beams or other structural systems, piping or conduit, the Contractor shall divide or curve ductwork to avoid said systems. Ductwork when divided shall maintain the same cross-sectional areas in accordance with the latest edition of the ASHRAE Guide.

B. Gauges of galvanized steel shall be as follows:

1. LOW PRESSURE DUCTWORK

Maximum Size <u>Inches</u>	Steel <u>Gauge</u>
Up to 8"	28
9" - 14"	26
15" - 26"	24
27" - 36"	22
37" - 50"	20

2. Ductwork shall be longitudinal seam, snap lock type, with aluminized duct tape applied over entire length of longitudinal and circumferential seams. Ductwork shall be externally insulated.
 - C. Furnish and install manually operated volume control dampers in all branches, splits, or at all supply air, return air, exhaust or transfer openings where necessary for proper balancing of air distribution. Dampers shall be of single blade type. Dampers shall have a quadrant type indicating device with lock to hold damper in position for proper setting. Damper shall be as Ruskin CDRS-25.
- 2-03 FLEXIBLE DUCTS
- A. Flexible ductwork shall be constructed in accordance with UL 181, Class 1, SMACNA DCS and additional requirements herein specified. Provide to connect between rigid ductwork and air diffusion devices. There shall be no erosion, delamination, loose fibers, or odors from the ducts into the air stream.
 - B. Flexible ductwork shall be satisfactory for operating pressure up to 6 inches water gauge.
 - C. Insulated flexible ductwork shall be constructed with aluminized mylar laminated to a corrosion resistant steel wire helix. Duct shall be insulated with one inch (1") thickness of fiberglass insulation having a density of 1 lb./cu. ft. Sheathe insulation with a vapor barrier having a maximum water vapor permeance of 0.20 perm in accordance with ASTM E96, Procedure A. Coat ends of insulation with cement to prevent erosion and delamination.
 - D. Maximum length of flexible ductwork shall not exceed 6'-0".
 - E. Flexible ducts shall be suspended on 36 inch centers with a minimum 3/4 inch wide flat banding material. All joints and connections shall be made with 1/2 inch wide positive locking steel straps.
- 2-04 CASINGS AND PLENUMS
- A. Factory fabricated components with field installation. Furnish certified testing data from plenum or casing manufacturer obtainable directly from an independent acoustical laboratory, listing sound absorption and transmission loss characteristics of panel assembly. Sound absorption coefficients and sound transmission loss, determined by an independent laboratory, shall be in accordance with ASTM C 423 and ASTM E 90 respectively.
- 2-05 DAMPERS
- A. Furnish and install manually operated volume control dampers in all branches, splits or at all supply air, return air, exhaust or transfer openings where necessary for proper balancing of air distribution. Dampers shall be of single blade type. Dampers shall have a quadrant type indicating device with lock to hold damper in position for proper setting. Damper shall be as Ruskin CDRS-25.
- 2-06 DIFFUSERS, REGISTERS, AND GRILLES
- A. Material and Finishes: Provide factory-furnished diffusers, registers, and grilles constructed of aluminum. Exterior and exposed edges shall be rolled, or otherwise stiffened and rounded.

Colors shall be selected by Owner.

- B. Sound Pressure Level: Manufacturer certified sound pressure level ratings of inlets and outlets. Conform with the following permissible room sound pressure levels:

NC Range, dB	Typical Application
30 - 35	Office or Laboratory Area

- C. Throw: The distance from the diffuser, register or grille to the point which the air velocity falls below 50 feet per minute shall not exceed 1.5 times the outlet mounting height.
- D. Drop: Maximum drop of air stream shall not be within 5 feet of the floor at the end of the throw.
- E. Ceiling Diffusers: Equip with baffles or other devices required to provide proper air distribution pattern as indicated. Provide factory-fabricated, single key, volume dampers. Except for linear diffusers, internal parts shall be removable through the diffuser neck for access to the duct and without the use of special tools.
- F. Square Diffusers: Construct each ceiling diffuser of four or more concentric elements designed to deliver air in a generally horizontal direction without excess smudging of the ceiling. Interior elements of square and rectangular ceiling diffusers may be circular, square, or rectangular as manufacturer's standard.
- G. Return Air and Exhaust Air Grilles
1. Ceiling Type Grilles
 - a. Grilles shall be 1/2" by 1/2" grid opening of aluminum construction. Grille shall be surface mounted. Grille shall be white finish. Size and capacity shall be as indicated on Plans.

2-07 DUCT SLEEVES, PREPARED OPENINGS, AND CLOSURE COLLARS

- A. Duct Sleeves: Fabricate from minimum 20-gauge galvanized steel. Where sleeves are installed in bearing walls, provide structural steel sleeves as indicated. Size sleeves to provide one-inch clearance between duct and sleeve or between insulation and sleeve for insulated ducts.
- B. Prepared Openings: Provide one-inch clearance between the duct and the sleeve, or one-inch clearance between insulation and sleeve for insulated ducts except at grilles, registers, and diffusers.
- C. Packing: ASTM C553, Type 1, Class B-2, mineral fiber.
- D. Closure Collars: Four inches wide minimum, fabricated from minimum 20 gauge galvanized steel.
1. Sizes and capacities shall be as indicated on drawings.

PART 3 - EXECUTION

3-01 INSTALLATION

Conform to NFPA 90A and SMACNA DCS. Provide mounting and supporting of ductwork and accessories including, but not limited to, structural supports, hangers, vibration isolators, stands,

clamps and brackets, access doors, and dampers. Provide electrical isolation between dissimilar metals. Electrical isolation may be fluorinated elastomers or sponge-rubber gaskets. Install ductwork accessories as indicated and as recommended by manufacturer's printed instruction. Allow clearance for inspection, repair, replacement, and service. Louvers in accordance with AMCA 501.

- A. Ductwork: Air distribution systems shall operate with no chatter or vibration.
1. Field Changes to Ductwork: Those required to suite the sizes of factory-fabricated equipment actually furnished, shall be designed to minimize expansion and contraction. Use gradual transitions in field changes as well as modifications to connecting ducts. Provide jumper ducts for discharging air into duct junctions as indicated.
 2. Dampers: When installed on ducts to be thermally insulated, equip each damper operator with stand-off mounting brackets, bases, or adapters to provide clearance between the duct and operator not less than the thickness of insulation. Stand-off mounting items shall be integral with the operator or standard accessory of damper manufacturer.
 3. Access Doors: Provide for automatic dampers, volume dampers, fire dampers, coils, thermostats, temperature controllers, valves, filters, humidifiers and other concealed apparatus requiring service and inspection in the duct systems.
 4. Duct Sleeves, Prepared Openings, and Closure Collars: Provide for ductwork penetrations in floors, walls, and partitions through which metallic ductwork passes.
 - a. Duct Sleeves: Fill space between duct and sleeve or between insulation and sleeve for insulated ducts with mineral fiber, except at grilles, registers, and diffusers.
 - b. Prepared Openings: Fill space between duct and opening or between insulation and opening for insulated ducts with mineral fiber, except at grilles, registers, and diffusers.
 - c. Closure Collars: Fit collars snugly around ducts or insulation. Grind edges of collar smooth to preclude tearing or puncturing insulation covering or vapor barrier. Provide nails with maximum 6-inch centers on collars.
- B. Ductwork Hangers and Supports: Ductwork hangers and supports shall be in accordance with SMACNA DCS, Section 4. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing member, provide suitable intermediate metal framing.
1. Flexible Ducts: Support ducts by hangers every 3 feet, unless supported by ceiling construction. Stretch flexible air ducts to smooth out corrugations and long radius elbows. Provide minimum length to make connections.
 2. Flexible Connectors: Provide flexible connectors between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connectors by zinc-coated steel clinch-type drawbands. For rectangular ducts, lock flexible connectors to metal collars.
 3. Inspection Plates and Test Holes: Provide, where required, in ductwork or casings for all balance measurements. If possible, test holes should be located at least 7.5 times diameters downstream from a disturbance. Extend cap through insulation.
 4. Flashing: Provide waterproof flashing where ducts pass through exterior walls or roofs.
 5. Cleaning of Ducts: Remove all debris and dirt from ducts and wipe clean. Before installing air outlets, force air through entire system at maximum attainable velocity to remove accumulated dust. Provide temporary air filters to protect ductwork which may be harmed by excessive dirt. For large systems, clean duct with high power vacuum

machines.

3-02 FIELD QUALITY CONTROL

Administer and direct tests. Furnish instruments, equipment, connecting devices, and personnel for the tests. Notify Contracting Officer 14 days before inspection or testing is scheduled. Correct defects in work. Repeat tests until work is in compliance.

3-03 TESTING AND BALANCING

Perform testing and balancing on ductwork systems in accordance with Section 23 08 00.

END OF SECTION

SECTION 23 34 00**EXHAUST FANS****PART 1 - GENERAL****1.1 SCOPE**

- A. Provide all material, equipment and labor required to complete the installation of exhaust fans shown on drawings and specified herein.
- B. Exhaust systems shall be in accordance with NFPA 90A.
- C. Exhaust fans shall be in accordance with the following industry standards:
 - AMCA 210 Testing Fans for Rating
 - AMCA 300 Certified Sound Ratings Program for Air Moving Devices
 - NEMA MG1 Motors and Generators
 - NFPA 90A Installation of Air Conditioning and Ventilation Systems
 - SMACNA DCS HVAC Duct Construction Standards - Metal and Flexible
 - UL 507 Electric Fans

PART 2 - PRODUCTS**2.1 ABOVE CEILING EXHAUST FAN**

- A. Fan shall be mounted above ceiling and vent routed through wall to weatherproof wall louver as shown on plans. Fan shall have forward curved wheel constructed of aluminum. Fan motor shall be of the shaded pole type. Housing shall be of steel construction with baked enamel finish. Fan shall have plug type disconnect. Fan shall have integral backdraft damper.
- B. Capacity and characteristics as indicated.
- C. As Cook Model specified, or approved equal.

PART 3 - EXECUTION**3.1 PREPARATION**

Provide storage for equipment and materials at the project site. Parts shall be readily accessible for inspection, repair, and renewal. Protect materials and equipment from weather.

3.2 FANS

Install with resilient mountings, flexible electrical leads, and flexible connections between fan inlet and discharge ductwork. Provide fixed sheaves required for final air balance and safety screen where inlet or outlet is exposed.

3.3 FIELD QUALITY CONTROL

Schedule and administer specified tests. Provide personnel, instruments, and equipment for

such tests. Correct defects and repeat the respective inspection and tests. Give the Contracting Officer ample notice of the dates and times scheduled for tests and trial operations. Conduct inspection and testing in the presence of the Contracting Officer.

- A. Inspection: Prior to initial operation, inspect equipment installation for conformance with drawings and specifications.

3.4 TESTING AND BALANCING

Test and balance each exhaust system in accordance with Section 23 08 00, "Testing and Balancing."

END OF SECTION

SECTION 23 81 13**PACKAGED AIR CONDITIONING AND HEATING EQUIPMENT****PART 1 - GENERAL**

1-01 SCOPE

- A. Provide all material, equipment and labor required to complete the installation of packaged air conditioning and heating equipment.
- B. Work Included: Packaged air conditioning and heating equipment shall include:
1. Split system direct expansion equipment.
- C. Packaged air conditioning and heating equipment shall be in accordance with the following industry standards:
- | | |
|------------------|---|
| ARI DCUAC | Directory of Certified Unitary Air Conditioning Equipment |
| ARI 210 / 240 | Unitary Air-Conditioning and Air-Source Heat Pump Equipment |
| ARI 410 | Forced Circulation Air-Cooling and Air Heating Coils |
| ASHRAE 15 | Safety Code for Mechanical Refrigeration |
| ASHRAE 52 | Equipment Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particular Matter |
| ASME/ANSI B16.22 | Wrought Copper and Copper Alloy Solder Joint Pressure Fittings |
| ASME/ANSI B31.5 | Refrigeration Piping |
| ASTM B 88 | Seamless Copper Water Tube |
| ASTM B 280 | Seamless Copper Tube for Air Conditioning and Refrigeration Field Service |
| ASTM F 872 | Filter Units, Air Conditioning: Viscous-Impingement Type |
| ASTM F 1040 | Filter Units, Air Conditioning: Viscous-Impingement and Dry Types, Replaceable |
| AWS A5.8 | Specifications for Filler Metals for Brazing and Braze Welding |
| FS OO-A-374 | Air Conditioners with Remote Condensing Units or Remote Air-Cooled, and Water Cooled Condenser Units, Unitary |
| MSS SP-58 | Pipe Hangers and Supports, Materials, Design and Manufacturer |
| MSS SP-69 | Pipe Hangers and Supports Selection and Application |

NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
UL 873	Temperature Indicating and Regulating Equipment
UL 900	Air Filter Units

- D. Submittals
1. Manufacturer's Catalog Data.

PART 2 - PRODUCTS

2-01 GAS FURNACES

- A. Furnaces shall be of the gas fired, upflow/horizontal type, complete with filters, centrifugal blower and motor, burners, heat exchangers, control and cabinet. Furnace shall be in accordance with AGA Z21.47.
- B. Filters shall be of the one inch (1") thick, disposable type, to serve the air flow capacity indicated on plans. Filters indicated are hammock type, but flat type may be incorporated if capacity is sufficient, at contractor's option. Provide two sets of filters for each unit; one set for use during construction and a new set to be installed when systems are turned over to Owner.
- C. Blower shall have forward curved blades, statically and dynamically balanced. Motor shall be of the variable speed type, complete with built-in overload protection.
- D. Controls shall consist of manual shut-off gas valve, spark ignition pilot gas valve, transformer (120-24 volt), combination fan and limit switch control and power induced draft blower. Thermostat shall be provided with furnace. Thermostat shall have Heat-Cool-Off and Fan On-Auto settings.
- E. Furnace cabinet shall be thermally and acoustically insulated with fiberglass.
- F. Furnaces shall have capacities and characteristics on Plans. Burner shall have an extended 15 year warranty. Burner shall be aluminized steel.

2-02 EVAPORATOR COIL

- A. Coil shall be sized to fit warm air furnace described above. Coil shall have copper tubes and aluminum fins. An insulated casing shall be provided around coil.
- B. Capacity and characteristics shall be as indicated on Plans.

2-03 CONDENSING UNIT

- A. Unit shall consist of compressor, condenser fan and controls enclosed in weatherproof casing.
- B. Casing shall be of galvanized steel construction, primed and finished in baked enamel.

- C. Compressor shall be of the hermetic type with motor located within refrigerant flow pattern resulting in low motor winding temperature. Twin internally mounted motor in-winding temperature sensing thermostats and a discharge gas temperature sensing thermostat shall provide safe operation of compressor.
- D. Compressor shall have spring loaded discharge valve, high suction intake ports and crankcase heater shall result in effective "slugging" protection. High and low pressure controls shall be provided and factory installed in compressor terminal box. High and low pressure reset shall be automatic. In addition, a low ambient cut-out thermostat shall prevent compressor operation below 22° degrees F.
- E. Condenser coil shall be constructed with copper tubes and aluminum fins, pressure tested to assure against leakage.
- F. Condenser fans shall be of the propeller type and shall be of aluminum construction.
- G. Unit capacity and characteristics shall be as indicated on Plans. Unit shall be rated in accordance with ARI Standard 240.

2-04 REFRIGERANT PIPING SYSTEMS

- A. Material and dimensional requirements for field-assembled refrigerant piping, valves, fittings, and accessories shall conform to ASHRAE 15 and ASME/ANSI B31.5, except as herein specified. Factory clean, dehydrate, and seal piping before delivery to the project location. Provide seamless copper tubing, hard drawn, Type "L", conforming to ASTM B88, except that tubing with outside diameters of 1/4 inch and 3/8 inch shall have nominal wall thickness of not less than 0.30-inch and 0.032-inch, respectively. Soft annealed copper tubing conforming to ASTM B 280 may be used where flare connections to equipment are required only in nominal sizes less than one inch outside diameter.
- B. ASME/ANSI B16.22 for solder-joint fittings, for flared tube fittings.

2-05 CONTROLS

- A. All units shall have wall mounted thermostats of the seven day programmable type. Unit shall have battery backup to save programming in case of outage.
- B. All units shall communicate directly and be controlled by the base energy management system (EMS).
- C. Current systems Siemens EMS. See drawings.

PART 3 - EXECUTION

3-01 EQUIPMENT INSTALLATION

- A. Install equipment and components in a manner to ensure proper and sequential operation of equipment and equipment controls. Install equipment not covered in this section, or in manufacturer's instructions, as recommended by manufacturer's

representative. Provide proper foundations for mounting of equipment, accessories, appurtenances, piping and controls including, but not limited to, supports, vibration isolators, stands, guides, anchors, clamps and brackets. Foundations for equipment shall conform to equipment manufacturer's recommendation, unless otherwise indicated. Set anchor bolts and sleeves using templates. Provide anchor bolts of adequate length, and provide with welded-on plates on the head end embedded in the concrete. Level equipment bases, using jacks or steel wedges, and neatly grout-in with a nonshrinking type of grouting mortar. Locate equipment to allow working space for servicing including shaft removal, disassembling compressor cylinders and pistons, replacing or adjusting drives, motors, or shaft seals, access to water heads and valves of shell and tube equipment, tube cleaning or replacement, access to automatic controls, refrigerant charging, lubrication, oil draining and working clearance under overhead lines. Provide electric isolation between dissimilar metals for the purpose of minimizing galvanic corrosion.

- B. Unitary Air Conditioning System: Install as indicated, In accordance with requirements of ASHRAE 15, end the manufacturer's installation and operational instructions. System shall be in accordance with NFPA 90A.
- C. Room Air Conditioners: Install units in accordance with manufacturer's instructions and provided with structural mountings, panels, and seals for weathertight assembly. Pitch unit as recommended by manufacturer to ensure condensate drain to drain pan without overflow.

3-02 PIPING

Brazing, bending, forming and assembly of refrigerant piping shall conform to ASME/ANSI 831.5.

- A. Pipe Hangers and Supports: Design and fabrication of pipe hangers, supports, and welding attachments shall conform to MSS SP-58. Installation of hanger types and supports for bare and covered pipes shall conform to MSS SP69 for the system temperature range. Unless otherwise indicated, horizontal and vertical piping attachments shall conform to MSS SP-58.
- B. Refrigerant Piping: Cut pipe to measurements established at the site and work into place without springing or forcing. Install piping with sufficient flexibility to provide for expansion and contraction due to temperature fluctuation. Where pipe passes through building structure pipe joints shall not be concealed, but shall be located where they may be readily inspected. Install piping to be insulated with sufficient clearance to permit application of insulation. install piping as indicated and detailed, to avoid interference with other piping, conduit, or equipment. Except where specifically indicated otherwise, run piping plumb and straight and parallel to walls and ceilings. Trapping of lines will not be permitted except where indicated. Provide sleeves of suitable size for lines passing through building structure. Braze refrigerant piping with silver solder complying with AWS A5.8. Inside of tubing and fittings shall be free of flux. Clean parts to be jointed with energy cloth and keep hot until solder has penetrated full depth of fitting and extra flux has been expelled. Cool joints in air and remove flame marks and traces of flux. During brazing operation, prevent oxide film from forming on inside of tubing by slowly flowing dry nitrogen through tubing to expel air. Make provisions to automatically return oil on halocarbon systems.

Installation of piping shall comply with ASME/ANSI 831.5.

- C. Returning Oil from Refrigerant System: Install refrigerant lines so that gas velocity in the evaporator suction line is sufficient to move oil along with gas to the compressor. Where equipment location requires vertical risers, line shall be sized to maintain sufficient velocity to lift oil at minimum system loading. Larger riser shall have a trap, of minimum volume, obtained by use of 90- and 45-degree elbows. Arrange small riser with inlet close to bottom of horizontal line, and connected to top of upper horizontal line. Do not install valves in risers.
- D. Refrigerant Driers, Sight Glass Indicators, and Strainers: Provide refrigerant driers, sight glass liquid indicators, and strainers in refrigerant piping in accordance with specifications, when not furnished by the manufacturer as part of the equipment. Install driers in liquid line with service valves and valved bypass line the same size as liquid line in which drier is installed. Size of driers shall be determined by piping and installation of the unit on location. Install driers of 50 cubic inches and larger vertically with the cover for removing cartridge at the bottom. Install moisture indicators in the liquid line downstream of the drier. Indicator connections shall be the same size as the liquid line in which it is installed.
- E. Strainer Locations and Installation: Locate strainers close to equipment they are to protect. Provide a strainer in common refrigerant liquid supply to two or more thermal valves in parallel when each thermal valve has a built-in strainer. Install strainers with screen down and in direction of flow as indicated on strainer's body.
- F. Solenoid Installation: Install solenoid valves in horizontal lines with stem vertical and with flow in direction indicated on valve. If not incorporated as integral part of the valve, provide a strainer upstream of the solenoid valve. Provide service valves upstream of the solenoid valve, upstream of the strainer, and downstream of the solenoid valve. Remove the internal parts of the solenoid valve when brazing the valve.

3-03 AUXILIARY DRAIN PANS, DRAIN CONNECTIONS, AND DRAIN LINES

- A. Provide auxiliary drain pans under units located above finished ceilings or over mechanical or electrical equipment where condensate overflow will cause damage to ceilings, piping, and equipment below. Provide separate drain lines for the unit drain and auxiliary drain pans.

Trap drain pans from the bottom to ensure complete pan drainage. Provide drain lines full size of drain opening.

3-04 FIELD QUALITY CONTROL

- A. Leak Testing: Upon completion of installation of air conditioning equipment, test factory- and field-installed refrigerant piping with an electronic-type leak detector. Use same type of refrigerant to be provided in the system for leak testing. When nitrogen is used to boost system pressure for testing, ensure that it is eliminated from the system before charging. Minimum refrigerant leak field test pressure shall be as specified in ASHRAE 15, except that test pressure shall not exceed 150 psig on hermetic compressors unless otherwise specified as a low side test pressure on the equipment

nameplate. If leaks are detected at time of installation or during warranty period, remove the entire refrigerant charge from the system, correct leaks, and retest system.

- B. Evacuation, Dehydration, and Charging: After field charged refrigerant system is found to be without leaks or after leaks have been repaired on field-charged and factory-charged systems, evacuate the system using a reliable gauge and a vacuum pump capable of pulling a vacuum of at least one mm Hg absolute.

Evacuate system in accordance with the triple-evacuation and blotter method or in accordance with equipment manufacturer's printed instructions.

END OF SECTION

SECTION 26 01 01 – ELECTRICAL GENERAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

- A. The “General Conditions” and “Special Conditions” of Contract as written and referred to hereinbefore are adopted and made part of Division 26.

1.2 DESCRIPTION OF WORK:

- A. Provide equipment, labor, etc., required to install complete working electrical system as shown and specified.
- B. Provide fixed electrical equipment, except where specifically noted otherwise.
- C. Provide portable electrical equipment for complete system.
- D. Provide equipment and/or wiring normally furnished or required for complete electrical systems but not specifically specified on the drawings or in specifications, as though specified by both.
- E. All equipment and wiring shall be new except where specifically noted otherwise.
- F. Electrical work includes, but is not limited to:
 - 1. Arrange with local utility companies for services as shown or specified.
 - 2. Removal or relocation of electrical services located on or crossing through project property, above or below grade, obstructing construction of project or conflicting with completed project or any applicable code.
 - 3. Alterations and additions to existing electrical systems.
 - 4. Complete 600-volt Distribution System. Provide meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, and/or other equipment forming part of system.
 - 5. Alterations and additions to raceway systems and terminal facilities for telecommunication system.
 - 6. Connection of all appliances and equipment.
 - 7. Complete alterations and additions to emergency lighting and power system, including reuse of existing generator, new transfer switch and individual battery units.
 - 8. Complete empty conduit raceways and outlet boxes only for public address system.
 - 9. Complete fire alarm and mass notification system.
 - 10. Complete empty raceway system(s) for auxiliary system(s) as shown.
 - 11. Complete system of outlets and raceways for master television antenna system.
 - 12. Complete raceway and terminal facilities for security system including the following:
 - a. Intrusion detection system.
 - b. Access control system.
 - c. Door locking control and monitoring system.
 - d. Closed circuit television system.
 - e. Door Alarm system.

13. Complete interior and exterior lighting.
14. Complete lighting control system.
15. Power provisions for UPS system(s) by others.
16. Provide temporary facilities for construction power.
17. Provide Government with training on all systems.

1.3 WORK NOT INCLUDED:

- A. Furring for conduit and equipment.
- B. Finish painting of conduit and equipment.
- C. Installation of motors except where specifically noted.
- D. Control wiring for mechanical systems, except where indicated to be provided by Electrical Contractor.
- E. Flashing of conduits into roofs and outside walls. Inform General Contractor of number and size of roof penetrations prior to bidding.

1.4 RELATED WORK SPECIFIED ELSEWHERE:

- A. Classification of excavation: Architectural Division.
- B. Painting: Painting Division.
- C. Concrete Work: Concrete Division.

1.5 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Obtain and pay for all permits required for the work. Comply with all ordinances pertaining to work described herein.
- B. Install work under this Division per drawings, specifications, latest edition of the National Electrical Code, Local Building Codes, and any special codes having jurisdiction over specific portions within complete installation. In event of conflict, install work per most stringent code requirements determined by Contracting Officer.
- C. Arrange, pay fees for and complete work to pass required tests by agencies having authority over work. Deliver to Contracting Officer Certificates of Inspection and approval issued by authorities.

1.6 QUALIFICATIONS OF CONTRACTOR:

- A. Has completed minimum two projects same size and scope in past five (5) years.
- B. This qualification applies to Sub-Contractors.
- C. Use workmen experienced in their respective trade. Submit qualifications of Superintendent for review.

- D. Government reserves right to reject bid of any Contractor failing to meet these qualifications.

1.7 GENERAL JOB REQUIREMENTS:

A. Drawings and Specifications:

1. Electrical work is shown on "E" series drawings inclusive. Follow any supplementary drawings as though listed above.
2. Drawings and specifications are complementary. Work called for by one is binding as if called for by both.
3. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices, and routing of conduits to a reasonable extent, without extra cost to Government.
4. In the event of conflict between drawings and specifications, apply the most stringent ruling and refer conflicts describing electrical work and work under other Divisions to Contracting Officer for remedial action.
5. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
6. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized.
7. Charges for extra work not allowed unless work authorized by written order from Contracting Officer approving charge for work.

B. Definitions:

1. Provide: Furnish, install and connect complete.
2. Wire: Furnish all necessary wiring and connect complete.
3. Install: Set in place and wire complete.
4. Work: Materials completely installed and connected.
5. AWG: American Wire Gage.
6. NEC: National Electrical Code (latest edition).
7. NFPA: National Fire Protection Association.
8. OSHA: Occupation Safety and Health Administration.
9. UL: Underwriters Laboratories, Inc.
10. NEMA: National Electrical Manufacturers Association.
11. IEEE: Institute of Electrical and Electronic Engineers.

C. Workmanship, Guarantee and Approval:

1. Work under this Division shall be first class with emphasis on neatness and workmanship.
2. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation subject to Contracting Officer's constant observation, final approval, and acceptance. Contracting Officer may reject unsuitable work.
3. Furnish Contracting Officer written guarantee, stating that if workmanship and/or material executed under this Division is proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.

4. In event that project is occupied, or systems placed in operation in several phases at Government's request, guarantee will begin on date each system or item of equipment is accepted by Government.
- D. Observations of Work and Demonstration of Operation:
1. At all observations of work, open panel covers, junction box cover, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.
 2. Contractor to assist Contracting Officer in demonstration of operation of new systems to satisfaction of Government. Contractor to have manufacturer available for demonstration of systems where requested by Government.
- E. Testing of Electrical Systems:
1. Test Completed work as follows:
 - a. Perform test required by Contracting Officer to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.
 - b. Insulation – use 1000 VDC insulation tester (0-500 megohm full-scale), equal to "Megger" as manufactured by Megger Company. Test conductors and busses of all systems, including feeders, main service busway, branches, etc.
 - c. Insulations test results shall be submitted and approved prior to connection of devices and equipment.
 2. Switchgear Test:
 - a. Prior to acceptance of new construction, all service and distribution equipment, including main switchboard, lighting panelboards, individually enclosed circuit breakers, and safety switches will be tested by the manufacturer. All test results are to be included in submittal data.
 - b. Tests will determine whether circuit breaker trip devices are functioning properly; contact surfaces and joints in switches and circuit breakers have minimum electrical resistance; all bolted connections are tight; bus bars properly braced.
 - c. Tests shall not affect Contractor's guarantee of materials and workmanship. Contractor to replace defective new equipment and devices without additional cost to Government
 3. Ground Testing:
 - a. Testing of Made Ground Electrodes:
 - 1) Test all Ground Systems.
 - 2) Using a measuring device which generates minimum of 500 DC, calibrated in ohms (maximum 200-ohm scale) as manufactured by Biddle or Megger/Biddle. (Biddle/Megger models DET20C and DET30C are acceptable).
 - 3) Provide test electrode in accordance with Measuring Device Manufacturer's instructions. Use ground rods as specified in Section "Grounding".
 - 4) Follow instructions of measuring device manufacturer for proper results.
 - 5) Test grounds only when earth is dry.
 - 6) Record ambient temperature, date, time, appropriate water table level (as obtained from local geologists); type of earth material.
 4. Low voltage:

- a. Test interval – 60 seconds. Test to be discontinued if erratic results are observed. Test records include date, ambient temperature, relative humidity and time of day.
 - b. Log readings on loose leaf paper for each circuit, electrode, device, etc.
- F. Materials and Substitutions:
1. All material shall be new, with U.L. label where available. If U.L. label is not available, material shall be manufactured in accordance with applicable NEMA, IEEE and Federal Standards.
 2. Submitted items or components shall be listed on sheet 1 of submittal brochure complete with identification mark (from drawings), manufacturer, catalog number and any other pertinent information. Submittals will not be reviewed without this summary sheet.
 3. Bind each set of submittal data. Submittals will not be reviewed if not bound.
- G. Shop and Erection Drawings:
1. Submit complete shop drawings for all material and equipment furnished under Division 26 of specifications, to Contracting Officer for review within (30) days after award of contract. Shop drawings shall be submitted on timely basis to allow adequate lead time for review, re-submission if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Contracting Officer/Contractor. Include complete descriptive data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Contracting Officer. Shop drawings and submittals shall bear the stamp of approval of the Electrical and General Contractor as evidence drawings have been checked by them. Drawing submitted without this stamp of approval will not be considered and will be returned for proper resubmission.
 2. Drawings larger than 8-1/2" x 11", submit 3 copies and 1 reproducible of each drawing. Contracting Officer will retain 2 copies and return 1 reproducible and 1 copy to Contractor. Contractor is responsible for copying reproducible for distribution.
 3. 8-1/2" x 11" drawing in brochure: Submit 6 original copies for review. Contracting Officer will retain 2 copies and return 4 copies to Contractor.
 4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor is responsible for dimensions and sizes of equipment. Inform Contracting Officer in writing of equipment differing from that shown.
 5. Prepare erection drawings when required by Contracting Officer. Investigate thoroughly all conditions affecting work and indicate on drawing. Contracting Officer will review erection drawings before work commences.
 6. Provide for Government three (3) sets of final shop and erection drawings, except provide 1 set of 1.5 mil mylar sepia of shop drawings larger than 8-1/2" x 11" size.
- H. Cooperation:
1. Carefully coordinate work with other contractors. Refer conflicts between trades to Contracting Officer.
 2. Work to be installed as progress of project will allow. Schedule of work determined by General Contractor and/or Contracting Officer.

- I. Maintenance and Operating instructions for Equipment:
 - 1. Submit to Contracting Officer three (3) sets of data prepared by manufacturer for each item of electrical equipment completely describing equipment. Data to include parts lists, description of operation, shop drawings, wiring diagrams, maintenance procedures and other literature required for maintenance of equipment. Bind in booklet form for presentation.

- J. "Record" Blue Line Prints:
 - 1. Provide "Record" blue line prints at the completion of job. Keep set of prints on job and record day changes to Contract drawings with red pencil. One complete set of blue line prints will be furnished to the Contractor for record drawings. Indicate actual location of conduit systems, outlets, and equipment. Turn over prints to Contracting Officer at final observation.
 - 2. After receipt of "Record" prints, Contracting Officer will forward to consulting engineer for corrections and return to contractor the corrected original tracings. Contractor shall make (and pay for) auto-positive reproductions of all floor plans and riser diagram. Reduce 1/4" scale drawings to 1/2 size; 1/8" scale drawings to be full size; reduce Riser Diagram to 1/2 size.
 - 3. Frame "Record" auto-positives under glass in extruded aluminum frame and mount with screws and inserts on wall. Mount Riser Diagram near Main Switchboard; Mount Floor Plans near panelboard involved. Where more than one panelboard is involved and are separated, provide framed auto positive near each panelboard.

- K. Items for Government:
 - 1. Provide following items for Government at time of substantial completion:
 - a. Certificates of inspection and approval from authorities having jurisdiction.
 - b. Certification of systems from installing Sub-Contractors (such as Fire Alarm, Security, etc.).
 - c. Written guarantees.
 - d. "Record" blue line prints.
 - e. Final approved shop drawings (3 sets).
 - f. Spare fuses (furnish receipt).
 - g. Maintenance data (3 sets).
 - h. Affidavit of Government Instruction (1 copy).
 - i. Test reports

- L. Protection and Storage:
 - 1. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury.
 - 2. Do not leave exposed or unprotected, electrical items carrying current. Protect personnel from exposure to contact with electricity.
 - 3. Protect work and materials from damage by weather, entrance of water or dirt. Cap conduit during installation.
 - 4. Avoid damage to materials and equipment in place. Repair, or remove replace damaged work and materials.
 - 5. Exercise particular care when working around telephone (electronic) equipment to prevent entrance of dust, moisture and debris into the equipment. Provide dust barriers and partitions as required.
 - 6. Deliver equipment and materials to job site in original, unopened, labeled container. Store to prevent damage and injury. Store ferrous materials to prevent

- rusting. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters.
7. Install equipment per manufacturer's recommendations. Conflicts between contract documents and these recommendations, deferred to Contracting Officer.
- M. Cutting and Repairing:
1. Cut and repair walls, floors, roof, etc., required to install work. Where work cut is finished, employ original installer of finish to repair finish. Do not cut structural members.
- N. Anchors:
1. Provide anchors for all equipment, raceways, hangers, etc. to safely support weight of item involved. Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable. Protect existing telecommunication equipment from drilling residue.
- O. Cleaning and Painting:
1. Clean equipment furnished in this Division after completion of work.
 2. Touch-up or re-paint damaged painted finishes.
 3. Remove debris, packing cartons, scrap, etc., from site.
- P. Starters:
1. Separately mounted starters are furnished under another Division but installed in Division 26 unless specifically noted otherwise.
- Q. Control Wiring:
1. Control Wiring including low voltage and line voltage interlock wiring will be furnished and installed under another Division, except where specifically shown otherwise. Carefully coordinate power and control wiring interface.
- R. Code Compliance:
1. Entire electrical installation shall comply with all aspects of code including local interpretations. This included but is not limited to:
 - a. Installation adjustment to meet all code clearances between electrical such as ductwork, other HVAC, plumbing, fire protection, and structural systems.
 - b. Locations for items such as fire alarm appliances, exit lights, egress lighting, disconnect switches, etc.
 2. No additional compensation will be allowed for code compliance. Notify Contracting Officer of difficulty encountered for assistance.

END OF SECTION 26 01 01

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SECTION 26 05 19 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Furnishing, installing and testing 600-volt conductors for lighting, power, and auxiliary systems.

PART 2 PRODUCTS

2.1 CONDUCTORS:

- A. 98% conductivity copper; #12 AWG minimum; #8 AWG and smaller solid, #6 and larger stranded.
- B. Conductors furnished with NEC, 600-volt, insulation as follows:

 Dry locations: type THWN or XHHW
 Wet locations: type RHH or THWN
- C. Wiring for controls and auxiliary systems #14 AWG stranded minimum with NEC type THWN insulation.
- D. Luminaire Wire - LED use type SF-2, #16 for luminaires up to 300 watts, and #14 over 300 watts, except for luminaires in concrete pour use #12 of larger or as shown. Conductors in channels of, and flex to luminaires type THHN or XHHW.
- E. Color Code as follows and/or per local ordinances. Conductors #10 and smaller with colored insulation. Conductors #8 and larger not available in colors, color coded with colored pressure sensitive tape. Apply minimum 2” of tape to each individual phase conductor in half lapped pattern. The equipment ground conductor and neutral conductors shall be taped green for their entire exposed length. Color-code as follows:

<u>Phase</u>	<u>120/208 Volts</u>	<u>277/480 Volts</u>
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	White
Eq Grnd	Green	Green

- F. Manufacturers of copper conductors: Pirelli, Phelps Dodge, Capital Cable, Rome Southwire, Senator, Essex, American, or approved equal.

- G. Manufacturers of aluminum conductors: Kaiser “817”, Alcoa “Excelloy”, or approved equal.

PART 3 EXECUTION

- A. Install wiring complete with connections to equipment.
- B. No wiring installed until after plastering and similar work is complete and dry.
- C. Install wiring so conductors are not in tension in completed system.
- D. Form wiring neatly and group in circuits. Tie grouped conductors with nylon ties, T&B “Tyrap” or approved equal.
- E. Use pulling compound of Ideal “Yellow 77”, Minerallac No. 100, or approved equal.
- F. Join and terminate copper conductors individually.
 - 1. Lugs in damp locations connected to copper bus: 98% conductivity copper or bronze Thomas & Betts “Locktite”, Burndy “QA” or approved equivalent.
 - 2. Lugs in dry locations and lugs connected to aluminum bus – heavy casting aluminum, CU/AL rated, listed under UL Standard 486B, rated 90 degrees C; plated to prevent electrolysis, Thomas & Betts, Blackburn, IlSCO or approved equivalent.
- G. Provide lugs where not furnished as part of equipment – furnish as specified above, to connect all conductors.
- H. Furnish lugs for conductors #2/0 and larger with two bolt tongue or approved equivalent.
- I. Make conductor taps #8 and larger from a second conductor with 98% conductivity bolted insulated connector, T&B “IDT”, IlSCO “KUP-L-TAP” or approved equivalent. Insulate splices with 600 volt “heat shrink” covers T&B or equal.
- J. Splice conductors #8 and larger with solid copper barrel, type fittings applied with an appropriate hydraulic tool. Splices used only where approved. Splice fittings: Burndy “Hydent”. Insulate splices with 600 volt “heat shrink” covers T&B or equal.
- K. Joints #10 and smaller: T&B Sta-Kon wire joints EPT66M, with insulating caps, installed with WT161 Tool or C nest of WT11M Tool; Ideal Super/Nuts; Ideal Wing Nuts; 3M “Scotchlock” or Buchanan Electric Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators installed with C24 pressure tool. Where joints are made in damp or wet locations insulate splices with 600 volt “heat shrink” covers T&B or equal.
- L. Join and terminate aluminum conductors individually:
 - 1. Lugs – heavy casting aluminum body, CU/AL rated, listed under UL standard 486B, rated 90 degrees C., plated to prevent electrolysis; Thomas & Betts, Blackburn, IlSCO, or approved equal. Provide two bolt tongue for #2/0 and larger conductors.

2. Splices – solid aluminum barrel, compression type; filled with no-oxide compound; Thomas & Betts, color keyed; Burndy “Hydent” or approved equal. Insulate splices with “Heat shrink” 600 volt covers, Thomas & Betts or equal.
 3. Taps – heavy casting aluminum body, CU/AL rated listed under UL Standard 486B, rated 90 degrees C., plated to prevent electrolysis; Thomas & Betts, Blackburn, IlSCO or approved equal. Insulate to 600 volts with rubber, electrical tapes or preformed covers.
- M. Provide cable supports: As required by NEC. Supports with malleable screwed conduit fitting and non-conductive wedges drilled for the conductors; O.Z. Manufacturing Company or approved equal. Furnish pullbox, sized per NEC for each cable support.
- N. Bond circuit ground wires where installed to all devices, equipment, outlet and junction boxes, and grounding bushings (where provided) with a full-size conductor and screw type connection.
- O. Securely fasten non-ferrous identifying tapes, pressure sensitive labels or engraved nameplates to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc.
- P. Mark all branch circuit conductors at panel terminations including neutrals with pressure sensitive numbers to correspond to circuit numbers connected.
- Q. Connect circuits and feeders as shown on drawings. Drawings are diagrammatic and do not show every detail required in the wiring system. Detail wiring accomplished per NEC.
- R. All conductors making up parallel feeders to be same size, same type, and same insulation, all cut same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner.
- S. DO NOT COMBINE CIRCUITS unless specifically approved by the contracting Officer. No more than 3 phase and 3 neutral conductors in a circuit.

END OF SECTION 26 05 19

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SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SCOPE OF WORK: Grounding Details

1.2 RELATED SECTIONS:

A. Section 26 35 53 – Surge Protection Devices.

PART 2 PRODUCTS

2.1 SYSTEM GROUNDING:

- A. Bond and ground main service neutral, cabinets, equipment, conduits, metallic piping systems, etc., per the latest edition of NEC.
- B. Ground conductors – 98% conductivity copper, either bare or with green THW insulation. Other conductor requirements same as described for low voltage, 600 volts, conductors.
- C. Ground Connections:
1. Make with mechanical connectors where accessible and with “Cadweld” or approved equivalent where inaccessible.
 2. Use high alloy cast copper and/or silicon bronze mechanical connectors with Hex or Allen head bolts where permitted.
 3. Size as required for piping connections.
 4. Thoroughly clean prior to installation of clamps and/or lugs.
 5. Use bolted or screwed on mechanical connectors. Do not use clip-on connections.
 6. Bond ground conductor to metal raceway at each end of the run and at each junction box or pull box.
 7. Seal connections between dissimilar metals (i.e.: bronze to steel), with approved epoxy resin.
 8. Coat connections with “No-OXID-A” compound as manufactured by Dearborn Chemical Company.
- D. Provide lighting and power circuits with green covered ground wire sized per NEC, or as shown, except not smaller than #12 AWG. Bond ground wire to all outlet boxes, junction and pull boxes, cabinets, equipment, etc., with self-tapping screw or bolt and appropriate lug. See Section covering “Raceways” for use of grounding bushing.

2.2 DRIVEN GROUND SYSTEM:

- A. Provide driven ground rods and buried ground conductor interconnecting ground rods as shown on drawings and required by code.
- B. Ground rods $\frac{3}{4}$ " x 10'-0" copperclad steel, Thompson #558 or approved equal. Ground rods installed with tops driven to 1'-6" minimum below grade. Connect ground wire to ground rod with Cadweld or equal installed in ground well endeavor.

- C. Bond all masses of metal, i.e.: pipes, conduits, fence posts, etc., within 6'-0" of the buried ground conductor to ground conductor with #6 AWG bare, solid, tinned copper wire, attached to object with appropriate clamp, lug, etc., (Cadweld or equal). Obtain complete set of drawings to determine quantity and location of required connections.
- D. All connectors lugs, hardware, etc., for building ground system similar to that for other grounding as described above.

2.3 CENTRAL OFFICE GROUND:

- A. Install system of copper bus bars connected together with 500 KCMIL copper conductor at telecomm backboard.
- B. Reference system to main water pipe as shown.
- C. Purpose of system – to provide reference ground point for telephone equipment.

2.4 COMPUTER GROUND SYSTEM:

- A. Provide radial isolated ground system for computer equipment as shown. Grounding systems shall be radial and isolated from each other to prevent formation of electronic loops. The grounding shall originate from the ground bus in central UPS distribution. This ground bus shall be designated the "ground window". The following ground system shall be complete and isolated:
 - 1. Equipment ground (green wire).
 - 2. Raceway system.
 - 3. Raised floor ground.
 - 4. Computer frame grounds.
- B. Each system shall originate at the "ground window" and extend radially to all connections.
- C. Test each system with 1000 VDC "megger" to prove isolation of different systems. Tests shall be same as described for feeders in Section 26 01 01. Furnish readings between all ground systems and a reference ground selected by Contracting Officer.

PART 3 EXECUTION

3.1 EQUIPMENT GROUND 'GREEN WIRE CONCEPT':

- A. Ground electrical equipment enclosures and conductor enclosures including metal raceways, outlet boxes, cabinets, switch boxes, motor frames, diesel engine frame, transformer cases, metallic piping systems such as water, gas, waste, air and metallic enclosures for all electrical equipment.
- B. Provide separate grounding conductor for all circuits to insure adequate ground fault return path.
- C. Install separate ground conductors in conduit.
- D. Bond green wire to equipment enclosure at source and at apparatus served.

- E. Insulate grounding conductor's size to carry ground fault current safely. Minimum size for green wire grounding lead per N.E.C. or as indicated.
- F. Do not use grounded current return conductors (neutrals) for equipment grounding. Connect common grounding lead to supply side of service disconnect unit only.
- G. Do not ground neutral conductor after it has been grounded at each separately derived system service entrance, transformer or generator.
- H. Maintain electrical continuity of conduit systems by threaded fittings with joints made-up wrench tight. Install insulated bushing and locknuts on terminating conduits. Provide conduits containing ground wires with grounding bushings bonded to ground wire with short full size jumper.
- I. Provide receptacles with approved green covered bonding jumper from the grounding terminal screw connected to outlet box.
- J. Install ground rods in quantity to provide a maximum of 5 ohms ground resistance. Where multiple rods required, separate a minimum of 10 feet and interconnect with wire of ground size shown.
- K. Test ground systems as specified in Section 26 01 01 – Electrical General.
- L. Install tags on ground connections to piping or electrode systems for all telephone equipment grounds.

END OF SECTION 26 05 26

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SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Outlet, junction boxes, conduit bodies, wiring gutters and their installation.

PART 2 PRODUCTS

2.1 OUTLET AND JUNCTION BOXES:

- A. Provide wiring devices, fixtures and special system outlets with outlet box. Use galvanized steel for concealed boxes and exposed boxes in dry locations. Use cast iron conduit fittings similar to “Condulets” or “Unilets” with threaded hubs for exposed boxes outside and exposed to moisture.
- B. Concealed outlets and exposed outlets in unfinished spaces for lights, switches, wall receptacles, etc.; consist of standard galvanized steel outlet boxes and plaster rings.
 - 1. Provide 1/16” thick boxes and covers of form and dimension adapted to its specific use and location, kind of fixture to be used and number, size and arrangement of connecting conduits.
 - 2. Provide 3/8” fixture studs where required.
 - 3. Ceiling Outlet Boxes: 4” octagonal or 4-11/16” square as required, due to number of wires, and 2” deep minimum. Ceiling boxes in slabs concrete type. Plaster rings not required for ceiling outlet unless needed for device.
 - 4. Paint junction boxes provided with blank covers to match surroundings, except use blank device plates in finished areas.
 - 5. Switch and receptacle outlet boxes: 4” square with plaster rings as necessary. Provide multigang boxes where shown or required. Provide metal barriers to separate emergency and normal service wiring per N.E.C.
 - 6. Steel City, Appleton, Raco, Bowers or approved equivalent.
- C. Use galvanized cast iron boxes, approved equivalent to Crouse-Hinds type “FS” or Appleton condulets, with appropriate covers for wall outlets in exposed conduit work and exposed to moisture.
- D. Use galvanized cast iron boxes equivalent to Crouse-Hinds type GRF for ceiling outlets in exposed conduit work exposed to moisture.
- E. Use square cut steel outlet boxes for outlets exposed in finished locations. Use round or square to adapt to device installed. Wiremold, Hoffman or approved equivalent.

2.2 LARGE JUNCTION BOXES:

- A. Furnish pull, tap and cable support boxes required by NEC for excessive number of 90-degree conduit bends, conductor taps and cable supports.
 - 1. Box construction per NEC and manufactured with galvanized sheet steel 12 gage minimum, with angle iron frame where required for rigidity; welded or bolted construction. Install bolts to prevent damage to cables in box.

2. Boxes with removable screw type covers and plated screws. Provide split covers where necessary for access. Maximum single piece cover – 36" x 36".
3. Provide separate junction boxes for each feeder. If conduit is installed so separate junction boxes are not practical, one large pull-box may be used with each set of feeder conductors separated by 12 gage steel barriers. Furnish junction box or each compartment in junction box with ground lug for connection of ground wire.

2.3 CONDUIT BODIES:

- A. Conduit bodies shall be installed to provide ease of pulling conductors and to provide neat appearance of conduit installation, and as shown on drawings. Conduit bodies constructed of malleable iron or copper free aluminum castings. Bodies shall be finished with standard durable exterior coatings of manufacturer specified. Provide rollers in type "C" and type "LB" bodies, 1-1/4" size and larger. Provide gasketed plated steel or malleable iron covers.
- B. Conduit bodies shall be manufactured by Crouse-Hinds, Pyle National, Killark, Appleton or approved equivalent.

2.4 GUTTERS (WIREWAYS):

- A. 8" x 8" and smaller – use standard assembly manufactured by Square "D", Walker Electric, B&C Stamping Co., and General Electric. Make special and larger gutters of code grade galvanized sheet steel with hinged covers and approved fastening device.

2.5 SURFACE METAL RACEWAYS:

- A. Where indicated on the drawings, wiring shall be run in exposed metal raceways, metal molding or wiremold complete with outlet boxes and fittings. All circuits run in surface metal raceways shall have a ground conductor with green insulation sized per the NEC, but not smaller than No. 12 AWG screw connected to each outlet box. All wiring in surface metal raceways shall be type "THWN" conductors.

2.6 TELEPOWER POLES:

- A. Where indicated on the drawings, wiring shall be run in Telepower Poles, complete with entrance end fittings, hanger clamps, trim plates, etc., as required. Poles shall be secured by means of a threaded rod attached to hanger clamp and to the structural ceiling above the grid. All circuits run in Telepower Poles shall have a ground conductor with green insulation sized per the N.E.C., but not smaller than No. 12 AWG connected to the screw terminal in the entrance end fitting and to the ground terminal on the receptacles in the pole. Poles shall only be used with partition furniture and be provided with furniture.

PART 3 EXECUTION

3.1 INSTALLATION OF OUTLET BOXES:

- A. Fasten outlet boxes securely to structure.

- B. Set all flush outlet boxes so edge of device flange is flush with finished surface.
- C. Open no more knockouts in outlet box than required.
- D. Seal boxes during construction.
- E. Stagger back to back boxes 3" minimum. In rated walls use appropriate U.L. spacing.
- F. Coordinate and verify rough-in location and mounting height of all boxes with drawings and other trades prior to installation.
- G. Support All Boxes:
 - 1. Outlet boxes – with 1/4" diameter galvanized rods or bolts anchored to structure.
 - 2. Outlet boxes for surface mounted luminaires on furred ceilings with 3/4" channel iron fastened to ceiling channels. See Section covering "Luminaires".
 - 3. Pull, junction and cable boxes with 3/8" diameter galvanized rods or bolts (4 minimum).
 - 4. Support outlet boxes in steel stud partitions with Caddy "BHA" bar hangers or approved equivalent.
- H. Install adjacent outlets at different levels in one vertical line where possible.
- I. Provide green covered bonding jumper, screw connected to outlet box in all receptacle boxes.
- J. Paint wiring connections in ground mounted outlets or floor outlets in wet locations with "Scotchkote" and fill box with "Duxseal".
- K. Mark outlet box covers with permanent ink markers to indicate circuit number(s) and panel of origination. Use black markers for normal service circuits and orange for emergency service.
- L. Use 4" octagonal boxes with blank covers for master outlets, installed to permit installation of collars by others.
- M. Where outlet boxes installed in unfinished concrete walls or columns, provide 1" deep plaster ring with box and ring set in position before the concrete is poured so concrete will fill around the ring and cover plate can be installed flush with the unfinished surface. In case of brick walls, follow same procedure with mason filling around the plaster ring with mortar.
- N. Install all outlets located on columns on centerline of column and bend or shift reinforcing so that the outlet box will be flush with the finished concrete. Provide plaster rings as required so that the plate is flush with the finished plaster or exterior concrete surface.
- O. Where outlets installed in waterproofed columns or walls, provide 6" x 6" x 3" deep wood box placed in the forms before concrete is poured. Box will be removed before waterproofing is applied. General Contractor will waterproof wall and opening, after which Electrical Contractor will install outlet box. General Contractor will grout around box. Set boxes carefully so that cover plates will be flush.

- P. Install conduit bodies where shown or where required for sharp bends and/or aesthetics in raceway system. Do not use in lieu of pull boxes except in limited space or as directed by Contracting Officer.

3.2 INSTALLATION OF JUNCTION BOXES:

- A. All junction boxes shall be accessible.
- B. Securely fastened to structure.
- C. Exterior below grade boxes shall be embedded 6" of concrete on sides and bottom. Top shall be level with finished grade unless shown otherwise.
- D. There shall be no more knockouts opened in any box than are actually required.
- E. Protect during construction.
- F. Identify (See Section 26 05 53).

3.3 INSTALLATION OF GUTTERS:

- A. Mount gutters on ¾" thick pressboard backboard, sized for devices to be mounted, 2 coats of fire-retardant paint (install label on board), mount all equipment thereon.
- B. Run conductors in gutter without reduction in size, entire length of gutter.
- C. Connect individual taps from conductor to tapped device with pre-insulated tap devices sized for conductors used.
- D. Gutter Tops: for copper conductors shall be ILSCO type GTA or PTA with GTC or PTC insulating covers or by "TEE" compression lugs as manufactured by Anderson or Burndy, wrapped with Scotch #33 electrical tape to a thickness which equals insulation level of wire.

END OF SECTION 26 05 29

SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. The accompanying General Conditions shall apply to and form a part of this Section.

PART 2 PRODUCTS

- A. Rigid galvanized steel conduit to conform to ASA Standard C80.1 and U.L. Standard No. 6 for rigid metallic conduit, except hot dipped galvanized after threading. Conduits manufactured by Republic, Wheatland, Southwire, Clifton, Triangle or Walker.
1. Fittings, ells, couplings, etc., galvanized threaded type meeting above standards. Threadless fittings not allowed.
 2. Terminate rigid conduit with two locknuts, one inside, one outside of the cabinet, junction or outlet and a bushing. Bushing – malleable iron with smooth bakelite ring molded into edge of bushing to prevent damage to cable, OZ Manufacturing Company, type “B” or approved equal. Where grounding bushings are required, construction of bushing similar to above except a lug provided for grounding connection, OZ type “BLG” or approved equal.
- B. Rigid intermediate grade conduit, IMC, to conform to UL Standard No. 1242; hot dipped galvanized or approved equivalent. Manufactured by Allied, Southwire, or ETP.
1. All fittings, ells, couplings, etc., constructed to same standards as rigid steel conduit. Fittings – threaded type with all threads engaged. Use “Uni-swivel” couplings in dry locations only.
 2. Conduit terminations same as rigid steel conduit.
- C. Flexible steel conduit, “Greenfield”, continuous spirally wound and inter-locked, threadless, galvanized conforming to U.L. and CSA Standards for flexible steel conduit; manufactured by National Electrical Products or International Metal Hose Company.
1. Connectors and fittings galvanized steel, threadless type with insulated throats, U.L. approved for grounding means, Thomas & Betts, Efcor, Midwest, Appleton, Raco, Steel City or ETP.
- D. Liquid tight flexible steel conduit constructed similar to flexible steel conduit above, except with polyvinyl chloride jacket, as manufactured by Anaconda “Sealtite” or Robroy – “Flex”.
1. Fitting Assembly – sealing type, with steel gland, nylon ring and ground cone inside locknut. All fittings with insulated throat, U.L. approved for grounding means. Fittings – Thomas & Betts, Efcor, Midwest, Appleton, Raco, Steel City or ETP.
- E. Aluminum rigid conduit to conform to UL standard No. 6 for rigid metal conduit, as manufactured by Kaiser or Alcoa.
1. Use aluminum fittings, except use steel locknuts. Join and terminate similar to rigid steel conduit. Lubricate all joints with compound.
- F. Electrical metallic tubing, EMT, threadless, steel type conforming to ASA Standard C80.3 galvanized inside and out, and with additional corrosion resistant finish. EMT

manufactured by Republic, Wheatland, Pittsburgh Standard, Southwire, Clifton, Spang-Chalfont, Triangle, Walker, or ETP.

1. Fittings, connectors, couplings, etc., insulated throat galvanized steel, raintight, compression type; Thomas & Betts, Efcor, ETP, Midwest, Raco, Appleton or Steel City.
- G. Plastic conduit, PVC, polyvinyl chloride compound, rated for direct burial, Schedule 40, except as noted otherwise, manufactured by Carlon, Sedco, ETP, Can-Tex or approved equivalent.
1. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Install conduit as follows:
1. Use rigid steel or intermediate grade conduit for:
 - a. Circuits run underground.
 - b. Circuits run in concrete in contact with earth.
 - c. Circuits in hazardous and wet locations.
 - d. Circuits exposed to mechanical damage.
 2. Use rigid Aluminum Conduit for:
 - a. All 400 cycle feeders and branches.
 3. Use electrical metallic tubing, EMT, for:
 - a. Branch circuits (conduit 1" diameter and smaller) in dry locations.
 - b. Telecommunication circuits.
 - c. Auxiliary systems and controls (low voltage systems such as fire alarm nurse call sound systems, etc.).
 - d. Feeders run overhead in dry locations.
 4. Use PVC conduit for:
 - a. Circuits run underground where indicated.
 - b. Where specifically shown on drawings.
 - c. No PVC shall be exposed.
- B. Size conduit per NEC. Minimum size 3/4" diameter, but no more than 7 #12 installed in 3/4" conduit.
- C. Run conduit concealed where possible. Run concealed conduit above furred ceiling in an orderly manner. Multiple conduits grouped and run parallel.
- D. Exposed Conduit: Use only where specifically shown or approved. Run perpendicular to building walls and partitions and tight against structure. Conceal vertical portion of conduits where possible.
- E. Paint underground metal conduit with 2 coats of asphaltum or bituminous. Make underground conduit fittings watertight using Teflon tape. Do not use split couplings and similar fittings underground and exposed to moisture. Run underground conduits minimum 24" below grade. Do not run conduit in slag fill.

- F. Paint conduit fittings and threads exposed to moisture with Rustoleum silver paint after installation.
- G. Furnish offsets required to meet field conditions. Make bends in conduit in accordance with the National Electrical Code, except make minimum radius of 6 times conduit diameter or 6" whichever is greater. Bend IMC conduit without deforming.
- H. Where conduit crossed expansion joints, install expansion type fittings OZ type EX with bonding jumper or approved equal.
- I. Make connections to equipment away from wall with conduit extensions exposed from ceiling to floor, anchored with floor flange and/or angle frame as required. Make connections to equipment with flexible conduit from tee conduit in conduit riser.
- J. Vibrating equipment and equipment requiring adjustment, i.e.: motors, transformers, etc. make final connections with flexible conduit.
- K. Isolate conduit connections to equipment on roof from roof penetration of conduit with short section of flexible conduit between roof penetration and equipment.
- L. Use liquidtight flexible conduit where exposed to moisture, oil, etc.
- M. Install conduit to avoid hot water pipes. Maintain 9" clearance of such pipes, unless closer crossings are unavoidable. Maintain minimum 1" clearance from covering of pipe crossed.
- N. Support conduit per NEC. Support individual conduits with galvanized hangers and rods as follows:
 1" diameter and smaller.....1/4" dia. Rod
 1-1/4" to 3" diameter.....3/8" dia. Rod
 Larger than 3" diameter.....1/2" dia. Rod
- O. Individual conduit hangers – Minnerallac or approved equal. Support EMT near each joint. Support for multiple conduit runs consist of Unistrut channel as required with 1/2" diameter galvanized bolts or rods anchored to structure. Provide "U" bolt clamps for each conduit on hangers. Support vertical riser conduits with galvanized bolted clamps at each floor. Do not support conduit to ceiling support system.
- P. Terminate conduits entering sheet metal boxes with double locknuts and ground bushings. Terminate conduit exposed to moisture with watertight hubs.
- Q. Install appropriate seal-off where conduits exit hazardous areas, areas of temperature differential interior/exterior penetration
- R. Where ground conductor installed in conduits 1-1/4" and larger provide grounding bushings, and bond full size ground wire to bushings and from bushing to box or cabinet. Bond with self-tapping screw and appropriate lug. Where ground wires are run in smaller conduits, bond to outlet and junction boxes with self-tapping screw lug. Provide other conduits with non-grounding bushings as described under another article. Provide all service entrance metallic raceways with grounding bushing and bond to ground bus; bond sized per N.E.C.

- S. Install aluminum conduit using “No-OXID-A” compound (Dearborn Chemical Company) on all threads.
- T. Conduit work in hazardous areas, or areas with large temperature differential: Use rigid steel or IMC conduit with sealing fittings, poured with hardening compound after conductors are pulled in. Seals installed per NEC. Conduit seals Crouse-Hinds type EYS or approved equal.
- U. Sleeves:
 - 1. Provide sleeves for raceways penetrating floor and structural members. Sleeves consist of Electrical Metallic Tubing set in forms. (Exception: Uses Schedule 40 PVC for individual ground conductors).
 - 2. Size sleeves to allow ½” clearance around raceway extending from bottom of floor construction to 2” above floor, minimum sleeve size 2-1/2” diameter. After raceways are installed, seal space between the raceway and sleeve with non-hardening, fireproof, compound, CTC PR-855 sealant, T & B “Flame Safe” for 2-hour fire rating or approved equal.

END OF SECTION 26 05 33

SECTION 26 05 36 – CABLE MANAGEMENT

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK:

- A. Installation of cable management for communications systems.
- B. Shop drawings.

PART 2 – PRODUCT

2.1 CONSTRUCTION:

- A. Manufacturers: B-line. Catalog numbers listed in this specification are for B-line products. Approved equals by Globe, PW Industries, Husky-Burndy.
- B. Provide complete system including, tray, offsets, tees, elbows, radius cable drop outs, grounding jumpers, hangers, etc. for complete system
- C. Extruded aluminum construction, center rail construction with cross section of 1.63"x3.25". Straight sections shall be 12'-0" in length, 24" wide with 6" cable loading depth. Rungs shall be single tier, 9" O.C., mechanically connected to center rail. Rung cross section shall be .54" x .54". Straight section equal to C4-A-DB-09-18-144.
- D. Straight sections and fitting designed to eliminate sharp edges or projections. Fittings to have same carrying capacity as straight sections. Provide necessary offsets, elbows, tees, etc., as required for complete system.
- E. Provide expansion joints for each 150 linear feet (or fraction thereof) of horizontal tray run, or where shown on drawings.
- F. Components of tray system grounded per National Electrical Code with grounding strap. Each section of tray and fittings bonded to tray with suitable fittings to maintain continuity of ground throughout system.
- G. Design load for Tray installation: 20 lb/LF with a .79" deflection for the maximum tray widths with 12-foot span.
- H. Hot dipped galvanized after fabrication.

PART 3 – EXECUTION

- A. Provide shop drawing for cable tray.
 - 1. At no less than 1/4" scale.

2. Provide cuts of tray and associated mounting components.
 - B. Use splice hangers at straight section splices, maximum 12'-0" O.C. Hang from structure with ½" threaded rod. Each hanger designed for 500 pounds safe load. Secure to structure with approved beam clamp or bolted anchors designed for 1000 lbs. load. Provide clevis hangers at locations where additional support is required (e.g. at elbows, tee or offset splices where hanger assembly is not integral with splice).
 - C. Use "No-OXID-A" compound where aluminum parts mate with steel or copper parts.
 - D. Cable tray installed so all parts of system are accessible for cable installation, inspection, and maintenance.
 - E. Provide hangers each side of expansion joint fittings within 24". Provide ground strap #3/0 copper across rails of tray for ground continuity.
 - F. Cable trays are reserved exclusively for Government provided telecommunication systems; no other cable shall be installed in trays unless specifically allowed by Contracting Officer.

END OF SECTION 26 05 36

SECTION 26 05 53 –IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Systems and equipment requiring identification are shown on the drawings, and extent of identification is specified herein and in individual sections of work.
- B. Types of electrical identification include:
 - 1. Exposed conduit color marking.
 - 2. Buried cable and conduit warnings.
 - 3. Cable/conductor identification.
 - 4. Operational instructions and warnings.
 - 5. Danger signs.
 - 6. Equipment/system identification signs (nameplates).

1.2 RELATED SECTIONS:

- A. Section 26 05 73 – Overcurrent Protective Devices Coordination Study

1.3 SUBMITTALS:

- A. Manufacturer’s Data:
 - 1. Product specifications and installation instructions for each material and device.
- B. Samples:
 - 1. Provide for each color, lettering style and other graphic representation.

PART 2 PRODUCTS

2.1 ELECTRICAL IDENTIFICATION MATERIAL:

- A. Color-Coded Conduit Materials:
 - 1. Color code all conduit with ¾ inch wide band of vinyl plastic electrical tape, 3M Company “Scotch 35”, applied two (2) full turns around conduit, 6” from all conduit terminations into switchboards, panelboards, motor control centers, starters, cabinets, control panels, pull boxes, outlet boxes, etc., on each side of walls, floors or roof penetrated by conduit and where conduit enters wall to outlets below.

SYSTEM	CONDUIT COLOR CODE COLOR
120/208 Volts, Normal	Black
277/480 Volts, Normal	Yellow
120/208 Volts, Emergency	Black and Red
277/480 Volts, Emergency	Yellow and Red
Fire Alarm/Mass notification	Red
Telecommunication	Blue
Security/Door Monitoring/Card Access	White

- B. Where authority does not allow tape, use paint acceptable to authority.
- C. Cable/Conductor Identification Bands:
 - 1. Manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers, wrap-around type; pre-numbered plastic coated, or write-on type with clear plastic self-adhesive cover flap, lettered to show circuit identification.
- D. Self-Adhesive ARC Flash Labels:
 - 1. Manufacturer's standard, self-adhesive, pre-printed, flexible vinyl signs for operational instructions or warnings. Sizes suitable for application and visibility, with proper wording for application.
 - 2. Color: Orange with black lettering.
- E. Engraved Signs (Nameplates):
 - 1. 1/8" thick melamine plastic laminate, complying with FS LP-387, sizes as indicated, engrave with standard letter style of sizes and wording indicated (1/4" letters minimum) white field, black letters for normal service; red field, white letters for emergency service; yellow field, blue letters for D.C. service. Punched for screws.
 - 2. Fasteners: Self-tapping stainless-steel screws, except contact epoxy adhesive where screws cannot or should not penetrate substrate.
- F. Lettering and Graphics:
 - 1. Coordinate names, abbreviations and other designations used with those shown or specified. Provide numbers, lettering, and wording as indicated or required for identification and operation/maintenance.

PART 3 EXECUTION

3.1 APPLICATION AND INSTALLATION:

- A. General installation requirements:
 - 1. After completion of painting.
 - 2. Comply with governing regulations and requests of governing authorities for identification of electrical work.
- B. Operational Identification and Warnings:
 - 1. Provide operational signs for main switch.
- C. Engraved Plastic Laminated Signs: Install on each major unit of electrical equipment in the building. Provide single line of text, 1/4" high lettering on 1" high sign (1-1/2" high where 2 lines required). Matching terminology and numbering of contract documents. Provide signs for each unit of the following categories (signs shall identify item fed, voltage where fed from):
 - 1. Electrical cabinets and enclosures. Indicate voltage.
 - 2. Access panel/doors to electrical facilities.
 - 3. Major electrical switchgear (indicate voltage).
 - 4. Safety switches and circuit breakers.
 - 5. Transformers.
 - 6. Feeders in pull and junction boxes and in all switchgear. Fasten with nylon ties.
 - 7. All equipment furnished in this Division of the specifications.

8. ARC Flash labels refer to Section 26 05 73 – Overcurrent Protective Devices Coordination Study.
- G. Install signs where indicated or most visible. Secure with screws or epoxy adhesive. Secure to feeder cables with nylon ties.

END OF SECTION 26 05 53

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SECTION 26 05 73 – OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Provide a short circuit, protective device coordination, and arc flash hazard determination study for the electrical distribution systems.
- B. Verify specified and supplied equipment are properly rated, correctly applied, within industry and manufacturer's tolerances. The short circuit study shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the distribution system down to the lighting panel level (or equivalent). The short circuit study shall consider operation during normal conditions, emergency generator conditions, cogeneration and/or any other operations which could result in maximum fault conditions.
- C. The Coordination study will determine correct settings for protective devices which minimize damage caused by an electrical fault and allow for selective coordination between devices. The coordination study shall assume an infinite buss the Utility Company's primary meter, and include primary cable, transformer and protective fusing, at the distribution transformer serving the building network protectors, (if applicable) cable limiters, switchboards, panelboard main, branch, or feeder circuit breakers. Coordination study shall consider operation during normal conditions, emergency conditions and any other adverse alternative operation.
- D. Study is subject to review by Contracting Officer/Contracting Officer of record and may require revision/modification as directed by Contracting Officer without any additional cost to the Government.

1.2 QUALIFICATIONS:

- A. Contractor shall have this study prepared by a Registered Professional Electrical Contracting Officer (licensed in the state where the project is completed) who has at least ten (10) years of experience and specializes in performing power system studies.

1.3 SUBMITTALS:

- A. The contractor shall submit the power system studies within 30 days after the electrical equipment submittals have been received for review by the Contracting Officer. The electrical submittals will be reviewed but will not be approved until the power system studies have been received, reviewed and approved.
- B. The power study shall be calculated using SKM, ETAP or ESA.
- C. Submit three (3) hard copies of the power systems study and one (1) electronic copy.

PART 2 EXECUTION

2.1 IMPEDANCE ONE-LINE DIAGRAM:

- A. Create an impedance one-line diagram. Develop from either riser diagram; one line diagram or the contract documents. Include additional existing field data not shown on one-line diagram. All electrical equipment wiring to be protected by the overcurrent devices installed under this project and each location where the fault current will be calculated shall be shown. Clearly show, on the one-line, the schematic wiring of the electrical distribution system. One-line diagram shall be submitted on 30x42 size sheet.
- B. Show reference nodes on the one-line diagram referring to a formal report, to include the following specific information:
 - 1. Short circuit values (symmetrical & asymmetrical) at the bus of the main service, and all downstream equipment containing overcurrent devices.
 - 2. Transformers kVA and voltage ratings, percent impedance, and wiring connections.
 - 3. Voltage at each bus.
 - 4. Identifications of each bus.
 - 5. Conduit material, feeder sizes, conductor material and length.
 - 6. Overcurrent protection (manufacturer, style and LTPU) rating.
 - 7. Motors and horsepower.

2.2 SHORT CIRCUIT STUDY:

- A. Pertinent data, rationale employed, and assumptions in developing the calculations shall be incorporated in the introductory remarks of the study.
- B. The study shall be in accordance with applicable ANSI Standards.
- C. Attach bus, determine the available short circuit contribution for:
 - 1. 3 phase bolted fault
 - 2. Line to line fault
 - 3. Double line to ground fault
 - 4. Line to ground faultIncorporate the motor contribution in determining the momentary and interrupting ratings of the protective devices where VFD's are used, assume regeneration type devices.
- D. Present the data determined by the short circuit study in a table format. Include:
 - 1. Node & Device identification.
 - 2. Operating voltage.
 - 3. Type of Protective device. (i.e. fuse, molded case circuit breaker, etc.)
 - 4. Device short circuit rating.
 - 5. Calculated maximum short circuit current under conditions or item 2.2.C above under symmetrical & asymmetrical conditions.
 - 6. Comments section indicating if a device is underrated.
 - 7. The Contractor is to be responsible for obtaining all data required for the completion of these studies. This shall include, but not be limited to, conductor material, insulation type, raceway type, conductor length, fuse, (size/type) breakers (sizes, style, manufacturer, trip plug) and other equipment data from submittals.

2.3 PROTECTIVE DEVICE COORDINATION STUDY:

- A. Obtain available fault current from utility company or other manufacturers as required. (e.g. existing 100 KW generator)
- B. The study shall adhere to all requirements of the current National Electrical Code and National Electrical Safety Code.
- C. The coordination study shall be an extension of the short circuit study described above. Prepare the coordination curves to determine the required settings of protective devices to assure selective coordination.
 - 1. Show coordination from primary fuse through all breakers, including loads in main distribution panel.
 - 2. Where main panel feeds a subpanel at the same voltage (i.e. not through a transformer) coordination shall include too largest breaker in subpanel.
 - 3. Where breakers feed step down transformers, include main breaker or largest breaker on secondary side of transformer.
- D. The phase and ground overcurrent protection shall be included, as well as settings for all other adjustable protective devices.
- E. Graphically illustrate on log-log paper that adequate time separation exists between devices. Sufficient curves shall be used to clearly indicate the coordination achieved between devices. Reasonable coordination intervals and separation of characteristic curves shall be maintained. Plot the specific time-current characteristics of each protective device in such a manner that the upstream devices will be clearly depicted on the sheet maintain to greatest extent possible minimum of 5 cycle separation between devices.
- F. The plots shall include complete titles, representative one-line diagram and legends, associated power company's relays or fuse characteristics, and complete parameters of transformers.
- G. The following specific information shall also be shown on the coordination curves:
 - 1. Device identifications.
 - a. Time and current ratio for curves.
 - b. Fuse, circuit breaker, and relay curves, showing complete operating bands of low-voltage circuit breaker trip curves.
 - c. Motor starting curves.
 - d. Low voltage fuses including manufacturer's minimum melt, total clearing tolerance and damage bands.
 - e. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
 - f. Ground fault protective device settings.
 - g. Other system load protective devices for largest branch circuit and feeder circuit breaker in each motor control center and panelboard.
 - h. Transformer inrush curves.
 - i. Conductor damage curves.
- H. Develop a table to summarize the settings selected for the protective devices. Include in the table the following:
 - 1. Device identification.
 - 2. Current transformer ratio, relay tap, time delay and instantaneous pickup.

3. Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands.
4. Recommendations for settings, on all low voltage breakers included in the contract.
5. Fuse rating and type.
6. Ground fault pickup and time delay.
7. Problem areas where protective devices do not coordinate under “real world” scenarios.

2.4 ARC FLASH STUDY:


- A. Calculate the arc flash hazard at each switchboard panel, disconnect, transformer etc. using breaker settings developed in the approved coordination study.
- B. Develop arc flash labels for installation onto electrical gear.
- C. The study shall adhere to all aspects of the National Electrical Safety Code.
- D. On Distribution System at 250V or less, served from a transformer 112.5KVA or less, assume an arcing fault duration of 1 second.

PART 3 ANALYSIS

- A. Analyze the short circuit calculations and highlight any equipment determined to be underrated or not coordinated.
- B. Contractor and his suppliers are responsible to provide a fully coordinated system including cost of equipment system modifications.
- C. Provide labels at each switchboard panel, disconnect, transformer or electrical apparatus listing the arc flash hazard and required personal protective equipment required to service that device using time and let thru values approved by contracting Officer of record after coordination study is approved. (See example at end of this specification.)

PART 4 REPORT

- A. The results of the power system study shall be summarized in a final report. The report shall include the following sections:
 1. Introduction, executive summary and recommendations, assumptions, impedance one-line drawing, and copies of the project one-line drawings.
 2. Tabulations of equipment ratings versus calculated short circuit values and commentary regarding same.
 3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 4. Copies of the manufacturer's time current curves for the devices studied and plotted on the time current curves.
 5. Arch flash labels for each switchboard, panel, transformer, disconnect, etc.
- B. Arc flash labels shall appear similar to the following example:

 <h1 style="margin: 0;">WARNING</h1>	
<h2 style="margin: 0;">Arc Flash and Shock Hazard Appropriate PPE Required</h2>	
<p>25.1 9 ft 7 in</p>	<p>Cal/cm² at 18 inches Flash Hazard Boundary</p>
<p>208 VAC 42 in 0 in</p>	<p>Nominal System Voltage Limited Approach Boundary Restricted Approach Boundary</p>
<p>Bus: MSB Prot.: Max Trip Time @ 2 sec.</p>	
<p>Equipment Name:</p>	

PART 5 CONTRACTING OFFICERS RESPONSE

- A. Contracting Officer of record will review report for compliance and approve, approve with comments or reject.
- B. Should contracting Officer disapprove study shall be reworked as required and resubmitted for review.
- C. After approval, modifications to equipment shall be made at no cost to Government.
- D. Additional days will not be added to the contract for non-compliance of study.

END OF SECTION 26 05 73

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SECTION 26 09 23 – LIGHTING CONTROL DEVICES

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 lighting control devices:
 - 1. Outdoor and indoor photoelectric switches.
 - 2. Multipole contactors.
- B. Related Sections include the following:
 - 1. Section 26 09 43 – Network Lighting Controls
 - 2. Section 26 27 26 – Wiring Devices

1.3 DEFINITIONS:

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS:

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.

PART 2 PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS:

- A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES:

- A. Description: Solid State, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.
 - 1. Light-Level Monitoring Range: 1.5 to 10 fc 16 to 108 lx, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
 - 2. Time Delay: 15-second minimum, to prevent false operation.
 - 3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.

4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

B. Approved Product: K4000 series by Intermatic, or equal by Tork or Paragon.

2.3 MULTIPOLE LIGHTING CONTACTORS:

A. Approved Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Cutler-Hammer; Eaton Corporation.
4. GE Industrial Systems.
5. Square-D.

B. Description: Electrically operated and mechanically or electrically held as shown, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast or LED device (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Control-Coil Voltage: Match control power source.

2.4 CONDUCTORS AND CABLES:

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 18 AWG.

C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 16 AWG.

D. Provide unshielded, twisted-pair cable for control and signal transmission conductors.

PART 3 EXECUTION

3.1 WIRING INSTALLATION:

A. Wiring Method: Comply with Division 16 Section "Conductors". Minimum conduit size shall be ½ inch (13 mm).

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Provide field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

- D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment.
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.2 IDENTIFICATION:

- A. Identify components and power and control wiring.
- B. Label time switches and contactors with a unique designation.

3.3 FIELD QUALITY CONTROL:

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify actuation of each sensor and adjust time delays.
- B. Remove and replace lighting control devices where test results indicate that they do 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. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION 26 09 23

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SECTION 26 09 43 – NETWORK LIGHTING CONTROLS

PART 1 GENERAL

1.0 SECTION INCLUDES

- A. Network lighting control system and components:
 - 1. Touch panel controls
 - 2. Lighting management panels
 - 3. Lighting management modules
 - 4. Low voltage wall stations
 - 5. Power interfaces
 - 6. Wired sensors

1.1. RELATED SECTIONS:

- A. Section 26 09 23 – Lighting Control Devices
- B. Section 26 27 26 – Wiring Devices
- C. Section 26 51 00 - Lighting

1.2. SUMMARY:

- A. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control
- B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed). Specific dimmers will be capable of “dimming lights to off”
- C. The system shall not require any centrally hardwired switching equipment.
- D. The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.

1.3 SUBMITTALS:

- A. Product Datasheets (general device descriptions, dimensions, electrical specifications, wiring details, nomenclature)
- B. Riser Diagrams – typical per room type (detailed drawings showing device interconnectivity of devices)
- C. Other Diagrams – as needed for special operation or interaction with other system(s)
- D. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up
- E. Hardware and Software Operation Manuals

F. Other operational descriptions as needed

1.4 PROJECT CLOSEOUT DOCUMENTATION:

- A. Provide a factory published manual
 - 1. Warranty
 - 2. Technical support contact
 - 3. Electronic manual on manufacturer's website for free download

1.5 QUALITY ASSURANCE:

- A. All steps in sensor manufacturing process shall occur in North America; including population of all electronic components on circuit boards, soldering, programming, wiring, and housing.
- B. All components and the manufacturing facility where product was manufactured must be RoHS compliant.
- C. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.
- D. All applicable products must be UL / CUL Listed or other acceptable national testing organization.

1.6 PROJECT CONDITIONS:

- A. Only install equipment after the following site conditions are maintained:
 - 1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C)
 - 2. Relative Humidity less than 90% non-condensing
- B. Standard electrical enclosures are permanently installed
- C. Equipment is protected from dust, debris and moisture

1.7 WARRANTY:

- A. Five (5) year 100% parts replacement

1.8 MAINTENANCE AND SUSTAINABILITY:

- A. Provide new parts, upgrades, and/or replacements available for a minimum of 5 years available to the end user
- B. Provide free telephone technical support

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Acuity Brands Lighting, Inc. – System: nLight by Acuity Controls is a basis of design. Other manufacturers meeting performance and intact of system specified herein will be considered provided they meet system requirements. Substitutions: Not Permitted:
1. All substitutions must be submitted in writing for approval at least 14 days prior to bid date.
 2. Proposed substitute products must be documented with a line by line compliance review

2.2 SYSTEM REQUIREMENTS:

- A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices 2) standalone lighting control zones.
- B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- C. System must interface directly with intelligent LED luminaires such that only CAT-5 cabling is required to interconnect luminaires with control components such as sensors and switches. Refer to electrical legend on drawings for list and part numbers of components.
- D. Intelligent lighting control devices shall communicate digitally, require <7 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
- E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- F. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.
- G. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- H. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- I. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, controls enabled luminaires, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- J. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in remotely located devices such as panels) to facilitate

system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.

- K. System shall have one or more primary wall mounted network control “gateway” devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- L. System shall use “bridge” devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.
- M. System shall be capable of wirelessly connecting a lighting zone to a WiFi (802.11n) wireless data network for purposes of eliminating the “bridge” devices and all cabling that connects zones to bridge devices.
- N. WiFi enabled devices shall be able to detect when WiFi network is down and revert to a user directed default state.
- O. WiFi-enabled devices shall be capable of current monitoring
- P. WiFi-enabled devices shall utilize WPA2 AES encryption
- Q. WiFi-enabled devices shall be able to connect to 802.11b/g/n WiFi networks
- R. WiFi-enabled devices shall have two local RJ-45 port for communicating with non WiFi-enabled system devices
- S. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- T. Devices located in different lighting zones shall be able to communicate occupancy, photocell (non-dimming), and switch information via either the wired or WiFi backbone.
- U. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces sequence of operation according to a time schedule so as to enable customized time-of-day, day-of-week, and utilization of a space. Note: Operating modes should be utilized only in manners consistent with local energy codes.
 - 1. Auto-On / Auto-Off (via occupancy sensors)
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 - c. Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic On functionality.
 - 2. Manual-On / Auto-Off (also called or vacancy)
 - a. Pushing a switch will turn lights on.

- b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
3. Manual-On to Auto-On/Auto-Off
 - a. Pushing a switch will turn lights on.
 - b. After initial lights on, zones with occupancy and/or photocell sensors turn lights on/off according to occupancy/vacancy and/or daylight conditions.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
4. Auto-to-Override On
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zone lighting then goes into an override on state for a set amount of time, or until the next time event returns the lighting to an auto-off style of control.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
5. Manual-to-Override On
 - a. Pushing a switch will turn lights on.
 - b. Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
 - c. Sequence can be reset via scheduled (ex. daily each morning) events.
6. Auto On / Predictive Off
 - a. Zones with occupancy sensors automatically turn lights on when occupant is detected.
 - b. Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
 - c. Pressing the switch will turn the lights off and a short “exit timer” begins. After the timer expires, sensor scans the room to detect whether occupant is still present. If no occupancy is detected, zone returns to auto-on. If occupancy is detected, lights must be turned on via the switch.
7. Multi-Level Operation (multiple lighting levels per manual button press)
 - a. Operating mode designed specifically for bi-level applications.
 - b. Enables the user to cycle through up to four potential on/off/dim low/dim high lighting states using only a single button.
 - c. Eliminates user confusion as to which of two buttons controls which load
 - d. Three different transition sequences are available in order to comply with energy codes or user preference).
 - e. Mode available as a setting on all devices that have single manual on/off switch (ex. nPODM, nPODM-DX, nWSX LV).
 - f. Depending on the sequence selected, every button push steps through relay/dimming states according to below table
 - g. In addition to achieving bi-level lighting control by switching loads with relays, the ability to command dimming outputs to “step” in a sequence that achieves bi-level operation is present.

MLO Mode		State of load after each pushbutton press			
		1st Press	2nd Press	3rd Press	4th Press
2-State (Alternating)	Load A	On	Off	Off	-
	Load B	Off	On	Off	-
2-State (Both On, A First)	Load A	On	On	Off	-
	Load B	Off	On	Off	-
2-State (Both On, B First)	Load A	Off	On	Off	-
	Load B	On	On	Off	-
3-State	Load A	On	Off	On	Off
	Load B	Off	On	On	Off
A and B On ¹	Load A	On	Off	-	-
	Load B	On	Off	-	-
A On Only ¹	Load A	On	Off	-	-
	Load B	Off	Off	-	-
A and B On & Dim High ¹	Load A	High	Off	-	-
	Load B	High	Off	-	-
Dim Low /High	Load A	Low	High	Off	-
Dim Low / High	Load A	High	Low	Off	-

NOTE 1: Modes for use only when Auto-On state of Load A & B is different than first MLO state

- V. A taskbar style desktop application shall be available for personal lighting control.
- W. An application that runs on “smart” handheld devices (such as an Apple® iPhone®) shall be available for personal lighting control.
- X. Control software shall enable logging of system performance data and presenting this information in a web-based format and downloadable to .CSV files.
- Y. Control software shall enable integration with a BMS via BACnet IP, although a hardware BACnet IP integration solution is also available.
- Z. System shall have pre-terminated plenum rated CAT-5e cabling supplied with hardware.

2.3 INDIVIDUAL DEVICE SPECIFICATIONS:

- A. Control module (gateway)
 - 1. Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet network.
 - 2. Devices shall have a user interface that is capable of wall mounting, powered by low voltage, and have a touch screen.
 - 3. Control device shall have three RJ-45 ports for connection to the graphic touch screen, other backbone devices bridges) or directly to lighting control devices (up to 128 per port).
 - 4. Device shall automatically detect all devices downstream of it.

5. Device shall have a standard and astronomical internal time clock.
 6. Device shall have one RJ-45 10/100 BaseT Ethernet connection.
 7. Device shall have a USB port
 8. Each control gateway device shall be capable of linking 1500 devices to the management software, with reduced memory version capable of support up to 400 devices.
 9. Device shall be capable of using a dedicated static or DHCP assigned IP address.
 10. Network Control Gateway device shall be the following nLight model Series: nGWY2
- B. Networked system occupancy sensors
1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
 2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
 3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
 4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
 5. All sensing technologies shall be acoustically passive, meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
 6. Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).
 7. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
 8. Sensors shall be available in multiple lens options which are customized for specific applications.
 9. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
 10. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
 11. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
 12. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
 13. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
 14. Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements.

15. Wall switch sensors shall recess into single-gang switch box and fit a standard GFI opening.
 16. Wall switch sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.
 17. Wall switch sensors shall have optional features for photocell/daylight override, and low temperature/high humidity operation.
 18. Wall switch sensors shall be available in four standard colors (Ivory, White, Light Almond, Gray)
 19. Wall switch sensors shall be available with optional raise/lower dimming adjustment controls.
 20. Wall switch sensors shall be the following nLight model numbers, with device color and optional features as specified in the electrical legend on the drawings:
 21. Network system shall have sensors that can be embedded into luminaire such that only the lens shows on luminaire face.
 22. Embedded sensors shall be capable of both PIR and Dual Technology occupancy detection or noted on the electrical legend.
 23. Embedded sensors shall have an optional photocell
 24. Embedded sensors shall be as noted in the electrical legend sheet E0.1
 25. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.
 26. Sensors shall be as noted on the electrical legend on sheet E0.1
- C. Networked system daylight (photocell and/or dimming) sensors
1. Photocell shall provide for an on/off set-point, and a dead band to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
 2. Photocell and dimming sensor's set-point and dead band shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
 3. Dead band setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
 4. Photocell and dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
 5. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
 6. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.
 7. Sensor shall be as noted on the electrical legend on sheet E0.1
 8. Network system shall have dimming photocells that can be embedded into luminaire such that only the lens shows on luminaire face.
- D. Networked System Power (Relay) Packs
1. Power Packs shall incorporate one Class 1 relay, a 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall

- incorporate the relay and 0-10 VDC or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
2. Power Packs shall accept 120 or 277 VAC, be plenum rated, and provide Class 2 power to the system.
 3. All devices shall have two RJ-45 ports.
 4. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
 5. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
 6. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
 7. Power Packs and Power Supplies shall be available that are WiFi enabled.
 8. Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
 9. Power Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
 10. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
 11. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
 12. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
 13. Power (Secondary) Packs shall be available that provide up to 20 Amps switching of general purposed receptacle (plug-load) control.
 14. Power (Relay) Packs and Supplies shall be as noted on the electrical legend.
- E. Networked System Wall Switches & Dimmers
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
 2. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
 3. All devices shall have two RJ-45 ports.
 4. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
 5. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
 6. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
 7. Devices with mechanical push-buttons shall be made available with custom button labeling
 8. Devices with a single “on” button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.

9. Wall switches & dimmers shall be as noted in the electrical legend
- F. Networked System Graphic Wall Station
1. Device shall have a 3.5" full color touch screen for selecting up to 16 programmable lighting control preset scenes or acting as up to 16 on/off/dim control switches.
 2. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
 3. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.
 4. Device shall enable user supplied .jpg screen saver image to be uploaded.
 5. Device shall surface mount to single-gang switch box.
 6. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply.
 7. Device shall have a micro-USB style connector for local computer connectivity.
 8. Device shall have two RJ-45 ports for communication
 9. Device shall be as noted in the electrical legend.

2.4. BMS COMPATIBILITY:

- A. System shall provide a BACnet IP gateway as a downloadable software plug-in to its management software.
- B. BACnet IP connection shall also be available utilizing JACE-600 hardware unit.
- C. BACnet IP hardware shall be capable of supporting up to 1500 total devices across up to 5 total Gateways.
- D. BACnet IP connection shall communicate information gathered by networked system to other building management systems.
- E. BACnet IP connection shall translate and forward lighting relay and other select control commands from BMS system to networked control devices via profiles stored in the system Gateway. All system devices shall be available for polling for devices status.

PART 3 EXECUTION

3.1 GENERAL:

- A. Install fixtures, control devices, power packs sensors, etc. as detailed on drawings.
- B. Initial powering up of system will defaults to standard factory presets. Include start up by factory trained technicians for final programming of system.

END OF SECTION 26 09 43

SECTION 26 22 13 – HIGH EFFICIENCY K-7 TRANSFORMERS

PART 1 – GENERAL

1.1 WORK INCLUDED:

- A. Copper-wound transformers exceeding US Department of Energy 2016 mandated minimum efficiency. These transformers shall be UL listed to feed a K-7 electronic equipment load profile and be optimized to minimize operating cost under light loading.
- B. Compliance with full specification is required.
- C. Basic compliance with NEMA TP1/EPACT2005, NEMA Premium, CEE Tier 1, or CSL3 is not sufficient to meet this specification due to the following:
 - 1. Efficiencies must exceed the US DOE 2016 minimum requirement.
 - 2. No load losses must comply with those defined in this specification.
 - 3. Efficiency at low load and under nonlinear K-7 load must meet the minimum requirements of this specification.
 - 4. K-7 listing per UL 1561 is required.
 - 5. Comprehensive testing under linear and nonlinear loading is required to verify specified performance.
 - 6. Performance submittals are required.

1.2 REFERENCES:

- A. US Department of Energy, 10 CFR Part 431, April 18, 2013. Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule.
- B. DOE Test Method for Measuring the Energy Consumption of Distribution Transformers under Appendix A to Subpart K of 10 CFR part 431.
- C. ANSI/NEMA ST 20 – Dry Type Transformers for General Applications.
- D. NEMA Premium Efficiency Transformers Program.
- E. Consortium for Energy Efficiency (CEE): Specification for Low-Voltage, Dry-Type Distribution Transformers.
- F. EPACT 2005 – United States Energy Policy Act 2005 / NEMA TP1 – Guide for Determining Energy Efficiency for Distribution Transformers.
- G. NEMA TP1 – Guide for Determining Energy Efficiency for Distribution Transformers.
- H. ANSI/NEMA TP-2 – Standard Test Method for Measuring Energy Consumption of Distribution Transformers.
- I. Metering Standards:
 - 1. Computational algorithms per IEEE Std 1459-2000
 - 2. UL 916, UL 61010C-1 CAT III

- J. IEEE C57, 110-1998 – IEEE Recommended Practice for establishing transformer capability when feeding nonsinusoidal load currents.
- K. IEEE Std C57.12.91-1995 Standard Test Code for Dry-Type Transformers.
- L. IEEE-1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
- M. LEED – Leadership in Energy and Environmental Design, U.S. Green Building Council.
- N. Seismic Qualification References: International Building Code, 2006/2009 Edition, California Building Code, 2007/2010 Edition, ASCE Standard 7, 2005 Edition to OSHPD CAN 2-1708A.5, Rev., ICC-ES AC 156, Effective 01/01/2007, OSHPD.
- O. ISO 9001: 2008 – International Standards Organization – Quality Management System.
- P. ISO 14001: 2004 – International Standards Organization – Environmental Management System.
- Q. ISO 17025 – International Standards Organization – General requirements for the competence of testing and calibration laboratories.

1.3 SUBMITTALS:

- A. Submit product data including the following:
 - 1. Test Reports per US DOE 10 CFR Part 431, NEMA TP2, of previously manufactured units – representative of the kVA range on the project, tested in ISO 17025 Certified Efficiency Test Lab, signed by test engineer, documenting history of production capability to comply with performance requirements of this specification.
 - 2. Test Reports per factory ISO Nonlinear Load Test Program, signed by factory test engineer of previously manufactured units – representative of the kVA range on the project, tested in ISO 17025 Certified Efficiency Test Lab, documenting history of production capability to comply with performance requirement of this specification.
 - 3. ISO 17025 Efficiency Test Lab Certificate where testing is performed.
 - 4. Where one or more of the integrated transformer meter options is selected for this project, provide associated documentation.
 - 5. Insulation system impregnate data sheet as published by supplier.
 - 6. Construction details including enclosure dimensions, kVA rating, primary & secondary nominal voltages, voltage taps, BIL, unit weight
 - 7. Basic Performance characteristics including insulation class, temperature rise, core and coil materials, impedances & audible noise level, unit weight
 - 8. Documentation of UL listing of 2” clearance from ventilated surfaces
 - 9. Inrush Current (typical 3 cycle recovery)
 - 10. Short Circuit Current data: Primary & Secondary
 - 11. Efficiency, Loss & Heat output Data
 - 12. No load and full load losses per NEMA ST20
 - 13. Linear load data @ 1/6 load

14. Linear load data @ 1/4, 1/2, 3/4 & full load
15. Linear Load efficiency @ 35% loading tested per NEMA TP-2.
16. Efficiency under K7 load profile at 16.7%, 25%, 50%, 75%, 100% of nameplate rating.
17. Factory ISO 9001 procedure describing nonlinear load test program
 - a. Meter and CT details including model, accuracy, serial numbers and calibration information.
18. 25 year Product Warranty Certificate
19. Copy of ISO 14001:2004 Certification
20. Copy of ISO 9001:2008 Certification
21. Documentation that materials used for shipment packaging meet the environmental requirements of this specification.
22. For LEED projects, provide the following additional submittal information:
 - a. Optimize Energy Performance: Provide baseline and proposed energy performance as defined in LEED-Submittal Template for this credit
 - b. Enhanced Commissioning: Provide installation and operations manual required by this credit for the Commissioning Agent

1.4 NONLINEAR LOAD TEST PROGRAM:

- A. Nonlinear Load Testing shall be carried out by an ISO 17025 Certified Efficiency Test Lab, and follow a defined protocol, independently audited within the ISO system.
- B. Efficiency shall be determined purely by measurements following IEEE Std C57.12.91-1995 Standard Test Code for Dry-Type Transformers. Other methods are not acceptable.
- C. The nonlinear load bank shall consist of phase-neutral equipment with a K-7 profile, representative of a mix of typical office receptacle loads.
- D. Meters and CTs shall both be revenue class accurate and carry current calibration certificates. CTs shall be operated within their approved accuracy loading range. Dual meters shall gather simultaneous primary and secondary energy and harmonic data. Meter and CT details including model, accuracy, serial numbers and calibration information.
- E. Efficiency: Measurements shall be taken at multiple load levels and plotted to show compliance with specification and correlation to the designed efficiency curve.
- F. Harmonic data including current and Voltage THD at the different load levels shall be included with the test report.

1.5 PACKAGING FOR SHIPMENT:

- A. Transformers shall be packaged for shipment using materials that will have the least environmental impact:
 1. Transformer Wrapping
 - a. Transformers shall be wrapped for shipment in a film coating that is 100% compostable and biodegradable.
 2. Transformer Shipping Base

- a. Transformers shall be shipped on a base that uses at least 50% less wood than traditional pallets.
 - b. Wood used in the shipping base shall be Forestry Stewardship Council (FSC) certified as having been sustainably harvested.
3. Shall minimize or eliminate use of materials that are not commonly recycled at the destination.
 4. Shall minimize labor, risk of injury and equipment damage, while handling from initial transportation through to final placement of the transformer.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Store and protect products.
- B. Store in a warm, dry location with uniform temperature. Cover ventilation openings to keep out dust, water and other foreign material.
- C. Handle transformers using lifting eyes and/or brackets provided for that purpose. Protect against unfavorable external environment such as rain and snow, during handling.

1.7 WARRANTY:

- A. Transformer shall carry a 25-year pro-rated warranty, which shall be standard for the product line.
- B. Manufacturer warranty shall remain in effect through a qualified seismic event.

1.8 COMMERCIAL PRODUCT:

- A. Transformer shall be a standard item in the manufacturer's catalog.

1.9 FACTORY PRODUCT PERFORMANCE VALIDATION:

- A. At time of order, the customer may request that the project engineer or other designated customer representative witness the performance testing of one or more of the transformers on the project at the manufacturer's facility, along with a demonstration of integrated metering option if specified.

1.10 ON-SITE PERFORMANCE VALIDATION:

- A. To insure that the products shipped to the job site meet this specification, provide on-site revenue class accurate efficiency and harmonic measurements of transformers once installed and operating at customer's site. Data shall be collected from primary and secondary sides of the transformer simultaneously on a synchronized cycle by cycle basis. The use of two discrete meters that are not synchronized is not acceptable. Sampling shall be of 10% of transformers on the project once installed and operating, as selected by Contracting Officer.

1.11 INTERNATIONAL STANDARDS ORGANIZATION REGISTRATION:

- A. Registration of the manufacturer to current versions of the following ISO standards is required.

1. ISO 9001: 2008 – Quality Management System
2. ISO 14001: 2004 – Environmental Management System

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCT:

- A. Basis of Design: E-Saver 2016 by Powersmiths International Corp. Equal transformers meeting these specifications manufactured by others will be considered provided they meet performance requirement of this specification.
- B. Manufacturers wishing to have products evaluated for acceptability and conformance with the performance requirements of this specification, shall provide detailed compliance and/or exception statements, along with the documentation required in the submittal section, including test documentation, signed by an engineer that confirms that the transformer meets the specified performance.

2.2 TRANSFORMER SPECIFICATION:

- A. Compatibility: This product must facilitate the ability of the electrical system to supply a sinusoidal voltage in order to improve the long-term compatibility of the electrical system with both linear and nonlinear loads.
- B. Copper-wound, 3-phase, common core, ventilated, dry-type, isolation transformer built to UL1561, NEMA ST20 and other relevant NEMA, UL and IEEE standards; 200% rated neutral; 60Hz rated; Transformers 750 kVA and less, 600 volt primary and less, shall be UL Listed and CSA Approved. All terminals, including those for changing taps, must be readily accessible by removing a front cover plate. Windings shall be continuous with terminations brazed or welded. 10kV BIL.
- C. Seismic Qualification: been seismically qualified in accordance with: International Building Code, 2006/2009 Edition, California Building Code, 2007/2010 Edition, ASCE Standard 7, 2005 Edition to OSHPD CAN 2-1708A.5, Rev., ICC-ES AC 156, Effective 01/01/2007, OSHPD approved: OSP-0110-10.
 1. Manufacturer warranty shall remain in effect through a qualified seismic event.
 2. Unit shall remain operational and shall not suffer electric or mechanical damage within the limits of a qualified seismic event.
 3. Certification Level: Short period spectral acceleration: SDS=1.5 g, Seismic importance factor: Ip=1.5, Installation height: z/h=1.0, Installation restrictions: None – Valid for below grade, at grade and roof installations in floor mounted configuration.

(Optional Seismic Severe Level) Same as above but short period spectral acceleration: SDS=2.28 g, includes seismic bracing option.
- D. Insulation System:
 1. Shall be NOMEX-based with an Epoxy Co-polymer impregnate for lowest environmental impact, long term reliability and long life expectancy.

- 2. Class: 220 degrees C.
 - 3. Impregnant Properties for low emissions during manufacturing, highest reliability and life expectancy.
 - 4. Epoxy co-polymer.
 - 5. VOC: less than 1.65 lbs/gal (low emissions during manufacturing)
 - 6. Water absorption (24hrs @ 25C): less than 0.05% (superior insulation, longer life)
 - 7. Chemical Resistance: Must have documented excellent performance rating by supplier.
 - 8. Dielectric Strength: minimum of 3200 volts/mil dry (for superior stress, overvoltage tolerance)
 - 9. Dissipation Factor: max 0.02 @ 25C to reduce aging of insulation, extending useful life.
- E. Operating Temperature Rise: 115 degree C in a 40 degree C maximum ambient
- F. Noise levels:
- 1. 3 dB quieter than NEMA ST-20
 - 2. Every unit to meet this noise level. Production Test every unit. Data to be available upon request.
- G. UL Listed & Labeled K-Rating: K-7 or higher
- H. Enclosure type: Indoor Ventilated NEMA 1, sprinkler proof where indoors, outdoor public where outdoors.
- I. Rear Clearance: UL Listed for 2” clearance from the wall rather than standard 6”. This capability shall be explicitly described on the nameplate of each unit.
- J. Meets US Department of Energy Efficiency Level 4 up to 150kVA.
- K. Meets US Department of Energy Efficiency Level 3 for 151kVA and larger.
- L. Exceed minimum efficiency requirements of US Department of Energy, 10 CFR Part 431, April 18, 2013, Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule which takes effect January 1, 2016, and comply with the table of Maximum No Load Losses, efficiency requirements at 1/6 load, efficiency at 35% load per 10 CFR Part 431, and efficiency at 25% load under a K-7 load profile.

kVA	No load losses (Watts)	Efficiency @ 1/6 load (%)	Efficiency @ 35% load (%)	Efficiency at 25% load under K-7 nonlinear load
15	47	97.85%	98.28	98.00%
30	71	98.27%	98.50	98.30%
45	97	98.40%	98.66	98.40%
75	135	98.63%	98.82	98.60%
112.5	195	98.70%	98.92	98.70%

150	235	98.80%	98.99	98.80%
225	330	98.90%	99.09	98.90%
300	400	98.95%	99.15	99.00%
500	650	99.00%	99.25	99.05%

M. Voltage Taps: For transformers 15kVA-500kVA, provide two 2-1/2% full capacity taps above and four 2-1/2% taps below nominal primary voltage.

N. Impedance: Between 3.0% and 6.0% unless otherwise noted.

O. Maximum Footprint for 115 degree C rise model in a NEMA 1 enclosure:

1. 18" Wide x 17" Deep x 27" High for 15kVA.
2. 26" Wide x 18" Deep x 30" High for 30, 45kVA.
3. 33" Wide x 22" Deep x 40" High for 75, 112.5kVA.
4. 38" Wide x 27" Deep x 48" High for 150kVA.
5. 38" Wide x 32" Deep x 52" High for 225, 300kVA.
6. 52" Wide x 38" Deep x 61" High for 500kVA.

P. TRANSFORMER OPTIONS TO BE SUPPLIED

1. Lockable Hinged Doors
 - a. Provide lockable hinged doors on the transformer to facilitate access in support of NFPA 70E/CSA-Z462 Arc Flash Standard to minimize arc flash risk when opening the enclosure of live equipment.
2. Integrated Access Port to Transformer Output Voltages and Currents to enable spot checks of load profile measurement without opening transformer enclosure
 - a. Supports NFPA 70E/CSA-Z462 Arc Flash Standard to provide operating data without opening transformer enclosure
 - b. Supply access to transformer output voltages and currents without opening the enclosure, via twistlock connectors, in support of NFPA 70E/CSA-Z642 Arc Flash Standard to avoid arc flash risk as associated with opening the enclosure of live equipment.
 - c. Currents shall be accessed via integrated FTRZ listed 333mV CTs.
3. Integrated Rotatable Infrared (IR) Viewing Port to address NFPA 70E/CSA-Z462 Arc Flash Standard
 - a. Provide integrated rotatable IR viewing port that provides single point viewing point that enables the thermal scanning of all live connections including primary and secondary feeder terminations and taps without requiring opening of the transformer enclosure or exposure to live parts.
 - b. The port shall be easily usable by a wide variety of makes and models of commercially available thermal scanning devices, without requiring any proprietary connectors, adapters or other components.
 - c. Basis of performance: Powersmiths Rotatable IR Viewing Port.
 - d. For the installation of one or more fixed IR windows to be considered an acceptable alternative on this project, the transformer manufacturer shall provide detailed drawings prepared by a qualified engineer detailing how all live terminals will be viewable. The manufacturer shall commit that should all terminals not be viewable, once installed, the manufacturer shall rectify the situation at their own expense.

4. Electrostatic Shield: Each winding is independently single shielded with a full-width copper electrostatic shield.
5. Lug Kit: Supply with standard screw-type lugs as specified at time of order
6. Low Inrush: less than 6 times primary full load current with a 3% source impedance

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Follow all national, state and local codes with respect to transformer installation.
- B. Where sound level may be of concern, utilize the services of a recognized and established Acoustical Consultant to provide the proper installation environment to minimize noise and vibration.
- C. Check for damage and loose connections.
- D. Set the transformer plumb and level.
- E. Mount transformer on vibration isolation pads suitable for isolating the transformer.
- F. Provide Seismic restraints where required.
- G. Coordinate all work in this Section with that in other sections.
- H. Verify all dimensions in the field.
- I. Adjust transformer secondary voltages to provide the required voltage at the loads.
- J. Upon completion of the installation, an infrared scan shall be provided for all bolted connections. Correct any deficiencies. Repeat thermal scan 3 months after installation and prepare a report for the Contracting Officer.
- K. PERFORMANCE VALIDATION: To insure that the products shipped to the job site meet this specification, provide on-site revenue class accurate efficiency and harmonic measurements of transformers once installed and operating at customer's site. Data shall be collected from primary and secondary sides of the transformer simultaneously on a synchronized cycle by cycle basis. The use of two discrete meters that are not synchronized is not acceptable. Sampling shall be of 10% of transformers on the project once installed and operating, as selected by customer. Submit a detailed report to the project engineer.
- L. Identify non-compliant products to the engineer and replace at no cost to the Government.

END OF SECTION 26 22 13

SECTION 26 24 16 – PANELBOARDS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Lighting and power panelboards and their installation.

1.2 SUBMITTALS:

- A. Provide shop drawings. Include individual diagram of each panelboard showing all specified requirements.

1.3 RELATED SECTIONS:

- A. Section 26 05 73 – Overcurrent Protective Devices Coordination Study
- B. Section 26 35 53 – Surge Protection Devices

PART 2 PRODUCTS

- A. Construct panelboards in accordance with latest NEMA and UL standards.
- B. Panelboards to be same manufacturer as other distribution equipment.
- C. Panelboard assembly UL labeled, and UL labeled as Service Entrance Equipment where used for that purpose.
- D. Panelboards to have integrated equipment fault rating equal to interrupting rating of lowest rated overcurrent device.
- E. Panelboards shall be factory assembled.
- F. Bussing:
 - 1. 98% conductivity copper, tinned at joints.
 - 2. Bus assembly designed for a maximum temperature rise of 55 degree C above 40 degree C ambient temperature when carrying rated current.
 - 3. Minimum thickness of bus bars – 3/32”.
 - 4. Bussing braced to withstand a fault current equal to the highest device interrupting capacity in the panel.
 - 5. Neutral bus full size copper on same basis as phase busses and insulated from the cabinet.
 - 6. Arrange bus bar connections so that adjacent vertical circuit protective devices are consecutively connected to phases A, B and C throughout panel. Provide 50% capacity ground bus in each panel cabinet, bolted to cabinet.
- G. Cable terminations:
 - 1. Include neutral and ground connections as shown.
 - 2. Make with separate, individual heavy casting aluminum, AL/CU rated lugs, Thomas & Betts, IlSCO, Blackburn or approved equivalent.
 - 3. Use 2 bolt tongue or equivalent connection to bus for #1/0 or larger cables.

4. Securely bolt lugs to bus with bolts, nuts and lock washers.
 5. Provide double lugs on main bus where shown. Use offset compression lugs as required.
- H. Circuit breakers:
1. Molded case, thermal-magnetic, quick-make, quick-break, trip free on faults, thermal-inverse time delay element and magnetic instantaneous trip coil in each ungrounded phase conductor, main breaker in main panel shall have a solid-state trip unit (LSI).
 2. Engrave breaker ampere rating on handle or trip unit.
 3. Furnish multipole breakers with internal common trip.
 4. Ground fault breakers class "A" type to trip on fault currents of 4-6 ma.
 5. Main circuit breakers UL rated for service entrance use.
 6. Switch "SWD" rated where required by NEC.
- I. Fusible Switches:
1. UL approved for Service Entrance use.
 2. Dual horsepower rated for AC and DC current.
 3. Accepts standard One Time, Current Limiting, or Dual Element fuses.
 4. Copper Fuse Clips, reinforced for good contact, mounted on insulated base.
 5. Interlocked hinged cover. (Interlock defeatable with screwdriver).
 6. Padlockable in "on" or "off" position.
 7. Quick-make, quick-break mechanism with simultaneous operating poles.
 8. Switch contact to be blade type, blow-off butt contacts acceptable only if manufacturer certifies contacts will remain closed under any fault conditions within limits of applied fuse.
- J. Panelboards classified by type over-current protection as follows:
1. BQL Bolted quick-lag circuit breaker distribution, 0-100 ampere branches, with minimum interrupting rating as indicated on the drawings.
 2. CCB Heavy duty convertible circuit breaker distribution, 0-800 ampere branches with minimum interrupting rating as indicated on the drawings.
- K. All spaces in panelboards usable. Panelboard space provided with necessary connections for future installation of overcurrent devices.
- L. Identification:
1. Permanently attach nameplates and circuit numbers to panel.
 2. Use horizontal consecutive circuit numbers for lighting and appliance panels unless shown otherwise on panelboard schedules.
 3. Provide typewritten circuit directories describing service of each circuit in Types BQL panels.
 4. Provide laminated plastic nameplate circuit identification for each circuit in Types CCB panels.
 5. Provide each panelboard with nameplate showing name and voltage.
- M. Manufacturers:
1. Panelboards manufactured by Siemens, Square "D", General Electric or Cutler-Hammer.

2.2 CABINETS: (Same manufacturer as interiors)

- A. Code thickness, hot dip galvanized steel or painted with trim and door. Hardware: combination latch and cylinder lock, all keyed the same. Provide celluloid or plastic covered directory card holder on the inside of door. Trim, door and exposed interior shall be finished with factory prime and smooth finish coat of the color selected by Contracting Officer. Reinforce cabinets as necessary for service and short circuit rating intended.
- B. Flush or surface as indicated of sufficient size to allow minimum 3" gutter space each side of panel and eight inches (8") at top and bottom, minimum 20" wide. Provide adjustable trim clamp, semi-flush hinges and inside rabbet.
- C. Provide panels with door in door trim construction.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Mount panelboards securely to building structure with 3/8" minimum diameter galvanized bolts and inserts number as required for size of panel, but not less than 4. Mount panelboards with centerline 4'-6" approximately above finished floor. Where panels of different heights are mounted adjacent, install top of panel trim at same height above floor. Close all unused openings.
- B. Where two sets of feeder cables are required in panel gutter space, run one set in each side of panel.

END OF SECTION 26 24 16

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SECTION 26 27 26 – WIRING DEVICES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Wiring devices and plates and installation.

1.2 RELATED SECTIONS:

- A. Section 26 09 23 – Lighting Control Devices

PART 2 PRODUCTS

2.1 DEVICES:

- A. Furnish devices shown on drawings. Catalog numbers establish a standard of quality. Equivalent devices manufactured by Hubbell, Sierra, Arrow Hart, Bryant, Leviton, General Electric or Daniel Woodhead may be used. Submit list of devices with catalog number proposed for review prior to ordering.
- B. Use Ivory color, except in special areas designated by the Contracting Officer, furnish color chart to Contracting Officer for selection.
- C. Special colors selected from standard available of either white, brown, black, grey or beige. Furnish color chart.
- D. Use red color for devices on emergency power circuits.

2.2 DEVICE PLATES:

- A. Furnish devices with cover plates, .04" thick, type 302, stainless steel with brushed finish.
- B. Device plates manufactured by Sierra or Hubbell.
- C. Furnish configuration of device plates required for multi-gang installations.
- D. Furnish in use weatherproof devices with individual gasketed aluminum or stainless-steel covers manufactured by Sierra or Hubbell.
- E. Use red color for devices connected to emergency electrical system.
- F. Engrave all device plates for devices with 1/4" high indicate panel of origination and catalog number.

PART 3 EXECUTION

- A. Install receptacles with ground wire from ground screw connected to outlet box.
- B. Install devices vertical unless shown otherwise.

C. Install receptacles with ground slot up.

D. Furnish devices as follows:

APPROVED DEVICES	NEMA CONF.	MANUF. NO.	CATALOG
Single Receptacle	5-20R	Hubbell	5361
Single Receptacle	6-20R	Hubbell	5462 with 5464
Single Receptacle	14-20R	Hubbell	8410 with 8411C
Single Receptacle	15-20R	Hubbell	8420 with 8421
Single Receptacle	5-30R	Hubbell	9308 with 9309
Single Receptacle	6-30R	Hubbell	9330 with 9331
Single Receptacle	14-30R	Hubbell	9430A with 6 ft. rubber cord set
Single Receptacle	6-50R	Hubbell	9367 with 9368 plug
Single Receptacle	14-50R	Hubbell	9450 with rubber cord set
Single Receptacle	L5-20R	Hubbell	*23000-HG with 23004-HG
Single Receptacle	(X-Ray)	Hubbell	25605 with 25615
Duplex Receptacle	5-15R	Hubbell	5252 * 8200
Duplex Receptacle	5-20R	Hubbell	5362 * 8310
Electric Water Cooler Receptacle	5-20R	Hubbell	6F5262 * 6F8200
GFI Duplex	5-20R	Hubbell	6F5262 * 6F8200
Wall Switch 1-Pole	20A	Hubbell	CSB120
Wall Switch 3-Way	20A	Hubbell	CSB320
Wall Switch 4-Way	20A	Hubbell	CSB420
Wall Switch Momentary Contact	15A	Hubbell	HBL1381
Wall Switch Narrow Type	20A	Arrow-Hart	QST-91 W/T-1600

END OF SECTION 26 27 26

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SECTION 26 28 23 – DISCONNECTS (MOTOR & CIRCUIT & SEPARATE CIRCUIT BREAKERS)

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Safety switches and disconnects and separately mounted circuit breakers.
- B. Provide shop drawing.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES:

- A. Heavy duty rated 250 or 600 volts as required; quick-make, quick-break operation; horsepower rated. If switch is not available with proper horsepower rating, classify switch as isolating switch only and provide nameplate reading, "DO NOT OPEN UNDER LOAD". Operating handle interlocked with switch door to prevent opening door with switch closed. Provide mechanical over-ride for authorized personnel to open switch door without operating switch handle.
- B. Fusible or non-fusible as shown. Furnish Bussman "Fuse-Tron" fuses for each fusible position, size as shown. Furnish 3 spare fuses for each size.
- C. Furnish with provisions for locking with padlock. Enclosures for switches NEMA 1, general purpose, NEMA 3R, raintight, or special enclosure, as shown.
- D. Standard product of Siemens, Square "D", General Electric, or Cutler-Hammer.

2.2 SEPARATELY MOUNTED CIRCUIT BREAKERS:

- A. Furnish and install separately mounted circuit breakers for overcurrent protection of feeders and branch circuits where shown on drawings.
- B. Circuit breakers: Thermal-magnetic, molded case type, rated 600 volts, with interrupting rating as indicated on the drawings.
- C. Individual circuit breakers shall be mounted in NEMA 1, general purpose surface or flush enclosures as shown.
- D. Circuit breakers shall be the standard product of G.E., Siemens, Square "D" or Cutler-Hammer.
- E. Lock-able switch.

PART 3 EXECUTION

- A. Secure disconnect switches to building or equipment surface as shown. If location shown is not suitable for installing, provide Unistrut P-1000 rack mounted as directed to secure switch.

- B. Disconnects shall be located to be accessible and within 5 feet or closer to equipment served.
- C. Provide engraved nameplates identifying equipment served, fuse or breaker size. Refer to Section 26 05 53 - Identification for Electrical Systems.

END OF SECTION 26 28 23

SECTION 26 35 53 – SURGE PROTECTION DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Surge Suppression Devices for main distribution panel, distribution and branch panel protection.

1.2 SUBMITTALS:

- A. Submit under provisions of Section 26 01 01 – Electrical General.
- B. Submit shop drawings of catalog data with complete description of materials and performance data.
- C. Submit a single impulse surge current test report issued by a nationally recognized testing facility & an ANSI/IEEE Category C3 (20KV, 10KA) life cycle test report. The test reports should demonstrate that each CAPS unit can withstand, in its installed configuration, the specified values (up to 200K transient amps per mode) without failure of any internal component (MOVs, wiring, printed circuit board, fusing and disconnect).
- D. Contracting Officer will not grant “prior approval” on equipment not specified within. Substitutions are permitted as long as they meet the specification requirements.

1.3 REFERENCES:

- A. TVSS must meet the recommendations of, and comply with, the most recent edition of:
 - 1. ANSI/IEEE C62.41, C62.41.1, C62.45, C62.48, C62.72.
 - 2. National Electric code, Article 285.
 - 3. Underwriters Laboratories: UL 1449 & UL 1283.
- B. Listed to UL 1149, Second Edition, 2005 Revision (effective Feb. 9, 2007).
- C. Secondary Surge Arrestor listed (service entrance unit only).
- D. Listed to UL 1283 for EMI/RFI filters.

1.4 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 26 01 01 – Electrical General
- B. Section 26 05 26 – Grounding and Bonding for Electrical Systems
- C. Section 26 05 33 – Raceways and Boxes for Electrical Systems
- D. Section 26 24 16 – Panelboards
- E. Section 26 27 26 – Wiring Devices

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

- A. Raceway and Fittings: Refer to Section 26 05 33 – Raceways and Boxes for Electrical Systems.
- B. Wire and Cable: Manufacturer shall provide 15' shielded cable type THHN, standard copper, for remote mounting of devices where space limitation prevent adjacent mounting to protected equipment.
- C. Surge Suppressor for Main Switchboard/MCC shall protect in all seven modes for a wye configuration (L-N, L-G, all phases & N-G). Tested surge current capacity of 200,000 amps per protection mode, minimum. Current Technology Model SL2-200 or approved equal. Provide a 100-amp breaker in the protected gear.
- D. Surge Suppressor for Distribution Panels shall protect in all seven modes for a wye configuration (L-N, L-G, all phases & N-G). Test surge current rating of 100,000 amps per protection mode, minimum. Current Technology Model TG100 or approved equal. Provide a 60-amp breaker in the panel for connection to the bus.
- E. Surge Suppressor for Branch Circuit Panels shall protect in all seven modes for a wye configuration (L-N, L-G, all phases & N-G). Test surge current rating of 60,000 amps per protection mode, minimum. Current Technology Model TG60 or approved equal. Provide a 60-amp breaker in the panel for connection to the bus.
- F. Each unit shall be capable of surviving at least the following Category C3 (20KV, 10KA) impulses without failing or degrading the UL 1449 surge suppression rating more than 10%:
- | | |
|--------------------------------|-----------------|
| Type 1 Main Distribution Panel | 12,000 impulses |
| Type 2 Distribution Board | 4,500 impulses |
| Type 3 Branch Circuit Panels | 3,500 impulses |
- G. Main Service Surge Suppressor shall be capable of protection the loads from the damaging effects of temporary over-voltages and voltage swells as defined by ANSI/IEEE Standard 1100=2005 (the Emerald Book) at 180% rated nominal voltage to a .7-ohm impedance load for 3,600 cycles.
- H. Main Service Surge Suppressor shall be dual listed under UL 1449, Second Edition, and 2005 Revision as a TVSS device and under UL 96, meeting the Secondary Surge Arrestor Requirements in the UL Master Label Certification Program.
- I. Diagnostic Monitoring System: The Surge Suppressor on the Main Service shall include the Master MIND Diagnostic Monitoring System. This system includes a microprocessor based digital monitor that displays RMS Phase Voltage, N-G voltage and current, # of Surges, # of sags, # of swells, #of power dropouts and outages, has an audible alarm, Form C Contacts and monitors each fuse in the Surge Suppressor system.

2.2 POWERLINE CORD/DIRECT-WIRED (120 VAC) SUPPRESSORS:

- A. Suppressors shall consist of a three-stage hybrid design. First stage M.O.V., second stage air-core 300 uh inductor, and third stage silicon avalanche diode.
- B. The suppressor shall provide certified test data confirming a fail short failure mode.
- C. Suppressor shall provide three suppression modes. Line to neutral, line to ground, and neutral to ground.

- D. Suppressor shall provide a maximum single impulse current rating of 10,000 amperes (8 x 20 us – waveform) per mode.
- E. Suppressor shall provide a pulse life rating of 3,000 amperes (8 x 20 us – waveform) every thirty (30) seconds for 2,000 occurrences.
- F. Suppressors maximum clamping voltage when subjected to the ANSI/IEEE C62.41 – 1980, Cat. B (6 kV – 1.2 x 50 us, 3kA impulse) shall not exceed 450 volts peak.

2.3 WARRANTY:

- A. The Surge Suppressor system shall have a fifteen (15) year limited product warranty from date of shipment against transient failure, when installed in compliance with applicable national/local electrical codes and manufacturer's installation manual.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Install in strict accordance with the manufacturer's printed instructions.
- B. Have a factory authorized representative inspect installation and verify that the complete system is working to factory specifications before final inspection. Provide affidavit of inspection in close out documents.
- C. The contractor shall fire seal all raceway openings between each SPD and the electrical gear it is protecting to prevent any air born particles from migrating to the electrical gear.

3.2 SERVICE ENTRANCE (480/277v 30, 4w) TYPE 1:

- A. Provide a service-entrance suppressor at each utility service entrance to the facility.
- B. Suppressor shall be installed on the load side of the first disconnecting point of the service.
- C. Conductors between suppressor and point of attachment to the service-entrance equipment shall be kept as short and straight as possible, preferably close-nipped to the device being protected. The mounting position of the suppressor shall permit a straight and short lead length connection between the suppressor and the point of connection to the device.
- D. Suppressor's ground shall be bonded to the service entrance grounding conductor and grounded conductor.

3.3 DISTRIBUTION PANELS TYPE 2:

- A. Install a secondary suppressor at each panelboard location as indicated on the drawings.
- B. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible.
- C. Separately mounted Suppressors shall be installed with separate grounding and grounded conductors. The grounding and grounded conductor shall have no contact at this point unless the service panel is a "separately derived system" according to NEC 250-5(d).

3.4 BRANCH PANEL TYPE 3:

- A. Install a secondary suppressor at each panelboard location as indicated on the drawings.
- B. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible.
- C. Separately mounted Suppressors shall be installed with separate grounding and grounded conductors. The grounding and grounded conductor shall have no contact at this point unless the service panel is a “separately derived system” according to NEC 250-5(d).

3.5 ELECTRONIC POWER SUPPLY:

- A. Install one each power line cord or direct-wired branch circuit suppressor between each equipment item and its power supply conductors as follows:
 - 1. Fire Alarm master panel.
 - 2. Building Management System head end.
 - 3. Security System head end.
 - 4. Telephone switch.
- B. Install suppressor according to manufacturer’s recommendations.

END OF SECTION 26 35 53

SECTION 26 51 00 – LIGHTING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

- A. Furnish and install all lighting luminaires, with all necessary accessories and lamps as shown, specified and/or scheduled.

1.2 RELATED SECTIONS:

- A. Section 26 09 23 – Lighting Control Devices.
- B. Section 26 01 01 – Electrical General for requirements for submittals.
- C. Division 1 for allowances and Government-furnished items to be installed under this Section.

1.3 ABBREVIATIONS:

- A. LED – Light Emitting Diode.

1.4 SUBMITTALS:

- A. Shop drawing submittals for luminaires shall include the following for each luminaire: Complete construction details including all dimensions, complete description of materials used, complete electrical data (including operating voltage), photometric test report from an independent testing lab, complete description of finish, and manufacturer catalog cutsheet of lamp to be used.
- B. Luminaire Manufacturer to have recognized safety labels on all fixtures: UL, ETL or CSA.
- C. Luminaire Manufacturer must be able to supply IESNA LM-80 test report for all LED fixtures.
- D. Luminaire Manufacturer must be able to supply IESNA LM-79 report as well as .ies data files produced by a NVLAP – accredited laboratory, per DOE CALIPER specifications.
- E. Delivered lumens and LPW of the luminaire must be listed on specification sheet.
- F. Chromaticity must be in the ANSI C78.377A color space and reported on the LM-80 report.

PART 2 PRODUCTS

2.1 LUMINAIRES:

- A. Furnish and install luminaires as shown in luminaire schedule, or otherwise indicated on the drawings. Manufacturer catalog numbers shown are for general descriptive purposes only and are intended only to establish the standard of quality.

- B. Locations of luminaires on electrical drawings are diagrammatic. Verify location of luminaires with architectural drawings prior to installation. Conflicts between electrical and architectural drawings shall be referred to the Contracting Officer for resolution.
- C. Provide luminaires complete with all options, accessories and other appurtenances required for a complete installation. Contractor shall verify type of ceiling and wall construction being installed, and provide luminaires properly configured for the type of construction.
- D. All luminaires shall be UL listed for the application being installed.
- E. Exit signs shall be furnished with 6" high letters with 3/4" stroke. Verify color of signage required by local code authorities. Signs shall meet all NFPA, UL and local building code requirements.
- F. Pendant stem mounted luminaires shall be furnished with ball aligner swivel, 30 degrees from vertical minimum, with swivel below canopy, with 1/2" diameter metal tube (stem).
- G. Plastic lenses and shielding shall meet NFPA and local building code requirements for light transmitting plastics.
- H. Metal luminaire housings shall be free of tool marks, dents, burrs and sharp edges. All metal parts shall be painted, galvanized or otherwise corrosion resistant.
- I. Reflector surfaces shall be finished specular, semi-specular, diffuse or painted as indicated. Specular finish materials shall have a minimum reflectance value of 83%. Semi-specular or diffuse finish shall have reflectance of 75% and white painted finish materials shall have reflectance of 88%.
- J. Luminaire support wires shall be zinc-coated, soft temper ASTM A641/A641M steel, 12 gage.
- K. Luminaires with aircraft cable suspension system shall use 1/16" diameter (minimum) stainless steel aircraft cable and adjustable cable gripper with swaged cable stop at ceiling canopy. Cable size shall be selected by luminaire manufacturer to provide adequate support.

2.2 LED LAMP AND DRIVERS:

- A. All LED fixtures pretested prior to shipment.
- B. Luminaire Manufacturer to use one of the top five LED suppliers to ensure quality standards are met at all times.
- C. Luminaire Manufacturer must perform a Thermal Management test to ensure that fixtures dissipate heat away from LEDs.
- D. Luminaire Manufacturer must employ tight binning specifications to limit color temperature variations.
- E. LED Drivers shall have a PF of ≥ 0.9 and THD of $< 20\%$.

- F. All electronic components within the fixtures shall be lead free, mercury free and RoHS compliant.
- G. LED boards are to be individually replaced or repaired without replacement of whole luminaire.
- H. Driver and LED boards easily accessible from below luminaire without removing fixture.
- I. Luminaire Manufacturer must offer a ten (10) year limited warranty backed by that manufacturer on the LEDs and Driver.
- J. Dimming LED drivers must dim to 1% or less.
- K. LED boards to include plug-in connectors for ease of upgradeability.
- L. LEDs minimally rated for 70% lumen maintenance at 50,000 hours (L70/50,000)

2.3 LAMPS:

- A. Furnish luminaires as specified in Luminaire Schedule.
- B. Correlated color temperature (CCT) of no greater than 4100K will be accepted.
- C. Color rendering index (CRI) of no less than 80 for interior applications will be accepted.

2.4 EMERGENCY LIGHTING:

- A. Provide luminaires and exit signs with self-contained battery power supplies as indicated. All equipment shall conform to UL924-Emergency Lighting and Power Equipment.
- B. Battery shall be sealed, maintenance-free lead-acid type (indoors) or nickel-cadmium (outdoors or unconditioned spaces) with 10-year nominal life. Unit shall incorporate a fully automatic solid state charger and automatic transformer relay to transformer to backup battery power supply upon failure of normal power.

PART 3 EXECUTION

- A. Support luminaires from structure of the building, independent from the ceiling membrane or finish material. Luminaire shall be set level, plumb, and square with ceilings and walls.
- B. Recessed lay-in luminaires in suspended grid ceilings shall not be supported solely from the ceiling grid. Provide devices for securing the luminaire to the ceiling grid to comply with the National Electrical Code ("earthquake clips"). Luminaires heavier than 20 pounds shall have supplemental support wires anchored to the structure above the ceiling.
- C. Recessed luminaires in fire-rated ceiling assemblies shall be installed in accordance with the UL listing of the assembly.

- D. Recessed luminaires (non lay-in or hard ceiling types) shall be supported by $\frac{3}{4}$ " steel ceiling channel, or factory-supplied hanger bars one on each side of the luminaire, anchored to ceiling structure. Recessed luminaires heavier than 20 pounds shall have supplemental support anchored to the structure above the ceiling. Do not use conduit to support luminaire.
- E. Provide recessed luminaires with appropriate frames, hardware and trim for the ceiling installed.
- F. Install luminaires free and clear of structural and mechanical interferences above the ceiling. If location indicated on the drawing conflicts with other elements, notify the Contracting Officer for directions for remedial action.
- G. Attach surface and pendant mounted luminaires to $\frac{3}{16}$ " fixture stud in outlet box. Luminaires in excess of 20 pounds shall have supplemental support anchored to the structure above the ceiling.
- H. Luminaires surface mounted to grid-type ceilings shall be mounted with Caddy IDS type clips anchored to structure above.
- I. Wall mounted luminaires shall be anchored to wall structure. Luminaire shall fully conceal the outlet box.
- J. Wiring to luminaires shall be with flexible metallic conduit to junction box. Do not wire luminaire to luminaire unless noted otherwise, or if using manufactured wiring systems.
- K. Individual flexible connections under 6 feet in length shall consist of 2 #14 and 1 #14 (ground) in $\frac{3}{8}$ " flexible metallic conduit (for circuits 20A or less). Bond ground wire and conduit at each end.
- L. Recessed luminaires in insulated ceilings shall be installed so that insulation is no less than 3 inches away from the fixture enclosure unless the luminaire is listed for direct contact with insulation (IC rated).
- M. Reflectors, trim cones, and other visible trim of luminaires shall not be installed until completion of ceiling work, and shall be clean and free of dust, fingerprints, scratches, dents, etc. upon substantial completion.

END OF SECTION 26 51 00

SECTION 27 10 05 – STRUCTURED CABLING FOR VOICE AND DATA

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Cabling and pathways inside buildings.
- B. Cross-connection equipment, enclosures, and outlets.
- C. Grounding and Bonding the telecommunications distribution system.

1.2 RELATED REQUIREMENTS:

- A. Section 07 84 10 – Firestopping - Electrical
- B. Section 26 05 26 – Grounding

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Cabling and Equipment
 - 1. Panduit
 - 2. AMP Netconnect/Tyco Electronic Corporation
 - 3. Siemen Company

2.2 SYSTEM DESIGN:

- A. Replace existing telecom and entertainment TV outlets with new outlets and cabling to existing equipment rack in Communications 103. Replace existing patch panels formerly serving demolished telecom outlets with Category 6 patch panels. Existing cable tray above ceilings to remain. Replace existing grounding system with ground bar and associated equipment shown on Electrical detail drawing E0.5. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, and outlets.
 - 1. Comply with TIA/EIA-568 and TIA/EIA-569, latest editions.
 - 2. Comply with TIA-570, latest editions.
 - 3. Provide fixed cables and pathways that comply with NFPA 70 and ANSI/J-STD-670 and are UL listed or third-party independent testing laboratory certified.
 - 4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
 - 5. Extend existing telecom equipment to new location as shown.
- B. Capacity:
 - 1. Offices and Work Areas: Provide minimum two voice outlet and two data outlet in each work area.
 - 2. Provide additional outlets where indicated on drawings.

- C. Main Distribution Frame (MDF):
 - 1. Existing data equipment to remain in place, protect during construction.
- D. Cabling to Outlets: Specified horizontal cabling, wired from each outlet to patch panel in Communications Room 103.

2.3 PATHWAYS:

- A. Conduit: Provide pull cords in all conduit.
- B. Underground Service Entrance: PVC, Type EPC-40 conduit.

2.4 COPPER CABLE AND TERMINATIONS:

- A. Copper Horizontal Cable: TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 22 AWG, 100 ohm; 4 individually twisted pairs; covered with blue jacket and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.
 - 1. In locations other than in plenums, provide NFPA 70 type CMG general purpose, CMR riser-rated, or type CMP plenum-rated cable.
 - 2. In plenums, provide NFPA 70 type CMP plenum-rated cable.
 - 3. Testing: Furnish factory reel tests.
- B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- C. Entertainment TV cable: RG-6 Coaxial cable with type "F" female connector at faceplate.
- D. Jacks and Connectors: RJ-45, non-keyed, terminated with 110-style insulation displacement connectors; high impact thermoplastic housing; complying with same standard as specified horizontal cable and UL 1863.
 - 1. Performance: 500 mating cycles.
 - 2. Voice and Data Jacks: 4-pair, per-wired to T568A configuration, with color indications for T568B configuration.

2.5 ENCLOSURES:

- A. Backboards: Existing plywood backboard to remain.
 - 1. Size: 48 inches wide by 96 inches high.
 - 2. Do not paint over UL label.
- B. Building Entrance Protector: Existing to remain. Protect during construction.
- C. Outlet Boxes: For flush mounting in walls; depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
 - 1. Size, Unless Otherwise Indicated: 4 inches square by 2-1/8 inches deep.
 - 2. Wall-Mounted Telephones: 4 inches high by 2 inches wide by 2-1/8 inches deep.
 - 3. Faceplates: Plastic, complying with system design standards and UL 514C.

4. Labels: Comply with TIA/EIA-606 using encoded identifiers; label each jack on the face plate as to its function with a unique numerical identifier. Labeling to be approved by Owner.
- D. Communications and TV outlets: shall be as specified on Electrical drawing E0.5.
- E. Patch panels: Category 6 in 24 or 48 patch configuration, as specified on Electrical drawing E0.5.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL:

- A. Comply with latest editions and addenda of TIA/EIA-568, TIA/EIA-569, ANSI/J-STD-607, NFPA 70, and System Design as specified in Part 2.
- B. Comply with latest editions and addenda of TIA-570, ANSI/J-STD-607, NFPA 70, and System Design as specified in Part 2.

3.2 PATHWAYS:

- A. Install with the following minimum clearances:
 1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 2. 12 inches from power conduits, cables and panelboards.
 3. 5 inches from lighting fixtures.
 4. 6 inches from flues, hot water pipes, and steam pipes.
- B. Conduit:
 1. Do not install more than two (2) 90-degree bends in a single horizontal cable run.
 2. Leave pull cords in place where cables are not initially installed.
 3. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
 - a. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
 - b. Treat conduit in crawl spaces and under floor slabs as if exposed to view.
 - c. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
 - d. Under floor slabs, locate conduit at 12 inches, minimum, below vapor retarder; seal penetrations of vapor retarder around conduit.
- C. Ground and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70. See electrical detail sheet E0.5 for grounding work and specification at existing backboard.
- D. Firestopping: Seal openings around pathway penetrations through fire-rated walls, partitions, floors, and ceilings in accordance with Section 078400.

3.3 INSTALLATION OF EQUIPMENT AND CABLING:

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.
 - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

- B. Service Loops (Stack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 - 1. At Distribution Frames: 120 inches.
 - 2. At Outlets – Copper: 12 inches.
 - 3. At junction boxes above ceiling serving modular furniture or demountable walls: 120 inches. Verify length with furniture layout.

- C. Copper Cabling:
 - 1. Category 5e/6: Maintain cable geometry; do not untwist more than 1/2" from point of termination.
 - 2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.

- D. Wall-Mounted Rack and Enclosures:
 - 1. Existing to remain. Protect during construction. Remove/relocate rack as required for new construction per Owner's direction.

- E. Field-Installed Labels: Comply with TIA/EIA-606 using encoded identifiers.
 - 1. Cables: Install color coded labels on both ends.
 - 2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.

3.4 FIELD QUALITY CONTROL:

- A. Comply with inspection and testing requirements of specified installation standards.

- B. Visual Inspection:
 - 1. Inspect cable jackets for certification markings.
 - 2. Inspect cable terminations for color coded labels of proper type.
 - 3. Inspect outlet plates and patch panels for complete labels.

- C. Testing – Copper Cabling and Associated Equipment.
 - 1. Test operation of shorting bars in connection blocks.
 - 2. Category 5e/6 Backbone: Perform near end cross talk (NEXT) and attenuation tests.
 - 3. Category 5e/6 Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

- D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone and document.

END OF SECTION 27 10 05

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SECTION 28 31 05 – MILITARY FIRE ALARM AND MASS NOTIFICATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY:

- A. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Alarm/Mass Notification System shall consist of all necessary hardware equipment and software programming to perform the following functions:
 - 1. Fire alarm system detection and notification operations.
 - 2. Control and monitoring of elevators, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.
 - 3. Two-way supervised firefighter's phone operations when applicable.
 - 4. One-way supervised automatic voice alarm operations.
 - 5. Monitor the Knox box for opening tamper.
- D. The Fire Alarm and Mass Notification drawings presented in the contract documents are only to be considered "schematic" in nature. UFC 3-600-01 and UFC-4-021-01 require that the Fire Alarm and Mass Notification systems be designed by a registered Professional Fire Protection Engineer who has been certified by the NCEES, or an individual that has obtained NICET, Fire Alarm Systems, Level III/IV certification. Final designs, calculations, submittals, and installation for this project are the responsibility of a Fire Alarm manufacturer and vendor whose staff includes a registered Professional Fire Protection Engineer, or a NICET, Level III/IV technician to certify all parameters of the design. This individual's name, signature, and professional engineer number or NICET certification number shall be included on all final design documents. All Fire Alarm and Mass Notification equipment and wiring drawings, calculations, and submittals shall be approved in writing by the Contracting Officer, or his assignee, before any Alarm work in the project facility may begin.

1.2 SCOPE OF WORK:

- A. Provide complete a Mass Notification/Fire Alarm System capable of network connectivity. The system shall report fire alarm and trouble conditions to the fire command center as well as receive mass notification messaging from the fire command center that will be broadcasted on the system.

1.3 ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS:

- A. Manufacturers: The equipment and service described in this specification are those supplied and supported by SimplexGrinnell and represent quality and intent of the equipment.
 - 1. Subject to compliance with the requirements of this specification, provide a Simplex 4100ES fire alarm/mass notification system or approved equal.
 - 2. Subject to compliance with the requirements of this specification, provide an American Signal Interior System Interface (ISI) unit or approved equal

for network integration.

3. Approved manufacturers of Fire Alarm Equipment for this project include Simplex, Siemens, and Notifier. Any fire alarm system submitted must meet or exceed the full specifications, and any system that fails to meet any single aspect of the specifications will be rejected in its entirety.

1.4 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
 1. Division 26: "Basic Electrical Materials and Methods."
 2. Division 26: "Wiring Methods."
 3. Division 21: "Fire Suppression".
 4. Division 21: "Fire Protection".
 5. Division 23: "HVAC Systems".
- C. The system and all associated operations shall be in accordance with the following:
 1. Requirements of the following Model Building Code: BOCA IBC, 2009 Edition
 2. Requirements of the following Model Fire Code: BOCA NFPA 1, 2009 Edition
 3. NFPA 72, National Fire Alarm Code, 2002 Edition
 4. NFPA 70, National Electrical Code, 2002 Edition
 5. NFPA 101, Life Safety Code, 2009 Edition
 6. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 Edition
 7. Local Jurisdictional Adopted Codes and Standards
 8. ADA Accessibility Guidelines
 9. UFC 4-021-01. Latest Edition
 10. UFC 3-600-01 Fire Protection Engineering for Facilities.

1.5 SYSTEM DESCRIPTION:

- A. Fire Alarm: Provide a complete, non-coded addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
- B. Mass Notification: Provide a complete mass notification system with combination clear/amber strobe devices (addressable style), internal and external speakers as indicated on drawings. The staff shall have the ability to activate from the Local Operator Controller (LOC) audible and visual alarm devices and provide real time pre-recorded messages or live voice information and instructions to all building occupants in the vicinity of the building(s).
- C. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable

- memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing multiple site-specific configuration programs with one active and one in reserve. Panel shall be capable of full system operation during new site-specific configuration downloads, master exec downloads, and slave exec downloads.
- D. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.
- E. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications.
- F. Wiring/Signal Transmission:
1. Transmission shall be hard-wired, using separate individual circuits for each zone of alarm operation as required or addressable signal transmission, dedicated to fire alarm service only.
 2. System connections for initiating device circuits shall be Class B, Style D, signaling line circuits shall be Class B, Style 4 and notification appliance circuits shall be Class B, Style Y.
 3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
- G. Remote Access:
1. FACP shall have the capability to provide Remote Access through a TCP/IP Ethernet connection.
 2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.
 3. FACP shall have the capability to provide third party access through a serial interface connection and be agency listed for specific interfaces and for the purpose.
- H. Required Functions: The following are required system functions and operating features:
1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
 2. Noninterfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.
 3. Transmission to an approved Supervising Station: Automatically route alarm, supervisory, and trouble signals to a supervising station service.
 4. Annunciation: Operation of alarm and supervisory initiating devices shall

- be annunciated at the FACP and the remote annunciator, indicating the type of device, the operational state of the device (i.e alarm, trouble or supervisory) and shall display the custom label associated with the device.
5. General Alarm: A system general alarm shall include:
 - a) Indication of alarm condition at the FACP and the annunciator(s).
 - b) Identification of the device /zone that is the source of the alarm at the FACP and the annunciator(s).
 - c) Operation of audible and visible notification appliances until silenced at FACP.
 - d) Closing doors normally held open by magnetic door holders.
 - e) Unlocking designated doors.
 - f) Shutting down supply and return fans serving zone where alarm is initiated.
 - g) Closing smoke dampers on system serving zone where alarm is initiated.
 - h) Initiation of smoke control sequence.
 - i) Transmission of signal to the supervising station.
 - j) Initiation of elevator Phase I functions (recall, shunt trip, illumination of indicator in cab, etc.) in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated, as appropriate.
 6. Supervisory Operations: Upon activation of a supervisory device such as a fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:
 - a) Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.
 - b) Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
 - c) Record the event in the FACP historical log.
 - d) Transmission of supervisory signal to the supervising station.
 - e) Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
 7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.
 8. System Reset
 - a) The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-arming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
 - b) Should an alarm condition continue, the system will remain in an alarmed state.
 9. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
 10. WALKTEST: The system shall have the capacity of 8 programmable passcode protected one person testing groups, such that only a portion of

the system need be disabled during testing. The actuation of the "enable one-person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

- a) The "city circuit" connection and any suppression release circuits shall be bypassed for the testing group.
- b) Control relay functions associated with one of the 8 testing groups shall be bypassed.
- c) The control unit shall indicate a trouble condition.
- d) The alarm activation of any initiating device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.
- e) The unit shall automatically reset itself after signaling is complete.
- f) Any opening of an initiating device or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

I. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported to the Supervising Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
6. The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a

- "SELF TEST ABNORMAL" trouble condition.
7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
 8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
 9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.
 10. UFC 3-600-01 will determine the number of smoke detectors required for this project.
- J. Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.
1. Automatic Voice Evacuation Sequence:
 - a) The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
 - b) All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.
- K. Speaker: Speaker notification appliances shall be listed to UL 1480.
1. The speaker shall operate on a standard 70.7VRMS NAC using twisted/shielded wire.
 2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet. Outdoor speakers should be capable of 15-watt taps.
 3. The speaker shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
- L. Manual Voice Paging
1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.
 2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.
 3. Total building paging shall be accomplished by the means of an "All Call" switch.
- M. Constant Supervision of Non-Alarm Audio Functions:
1. When required, the system shall be configured to allow Non-Alarm Audio (NAA) functions such as background music or general/public address paging.
 2. During NAA operation, the speaker circuit shall be electrically supervised to provide continuous monitoring of the speaker circuit.
 3. During an alarm condition, supervision shall be disabled, and alarm signals delivered to speakers.

- N. Fire Suppression Monitoring:
1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
 2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
 3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.
 4. Kitchen suppression system under hood shall be separately mounted and activation of hood system shall shut trip branch feeder electrical device under hood.
- O. Fire Alarm and Mass Notification system shall communicate via Monaco radio transceiver to base fire department. Communicate with base fire department for exact model number to match existing base standards.
- P. Power Requirements
1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
 2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
 3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
 4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
 5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
 6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
 7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
 8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.6 SUBMITTALS:

- A. General: Submit the following according to Conditions of Contract.
1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this

- specification.
 2. Wiring diagrams from manufacturer.
 3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.
 4. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate in accordance with the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
 5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, SLC, NAC, relay, sensor, and auxiliary control circuits.
 6. Operating instructions for FACP.
 7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
 8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
 9. Record of field tests of system.
- B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions, if required, to make clarifications or revisions to obtain approval.
- C. Submittals and complete system design shall be prepared by designer with NICET Level II Certification.

1.7 QUALITY ASSURANCE:

- A. Installer Qualifications: A factory authorized installer is to perform the work of this section.
- B. Each and every item of the Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.8 MAINTENANCE SERVICE:

- A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.
- B. Basic Services: Within the warranty period, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.
- C. Renewal of Maintenance Service Contract: No later than 60 days prior to the

expiration of the maintenance services contract, deliver to the Government a proposal to provide contract maintenance and repair services for an additional one-year term. Government will be under no obligation to accept maintenance service contract renewal proposal.

1.9 EXTRA MATERIALS:

- A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
 - 1. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.
 - 2. Notification Appliances: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
 - 3. Smoke Detectors or Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of each type and number of units installed but not less than one of each type.
 - 4. Detector or Sensor Bases: Furnish quantity equal to 2 percent of each type and number of units installed but not less than one of each type.
 - 5. Provide spare parts kit for the ISI units per manufacturers recommendations.

PART 2 PRODUCTS

2.1 FIRE ALARM CONTROL PANEL (FACP):

- A. General: Comply with UL 864, "Control Units and Accessories for Fire Alarm Systems".
- B. The following FACP hardware shall be provided:
 - 1. Power Limited base panel with beige cabinet and door, 120 VAC input power.
 - 2. 2,000-point capacity where (1) point equals (1) monitor (input) or (1) control (output).
 - 3. 2,000 points of Network Annunciation at FACP Display when applied as a Network Node.
 - 4. 2000 points of annunciation where one (1) point of annunciation equals:
 - 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
 - 1 LED on panel or 1 switch on panel.
 - 5. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FACP LCD Display.
 - 6. Municipal City Circuit Connection with Disconnect switch, 24VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output. Provide signal shall be via MONACO radio transceiver and match existing base standards.
 - 7. One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
 - 8. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
 - 9. Three (3) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).

10. Where required provide Intelligent Remote Battery Charger for charging up to 110Ah batteries.
 11. Power Supplies with integral intelligent Notification Appliance Circuit Class B for system expansion.
 12. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.
 13. The FACP shall support up to (5) RS-232-C ports and one service port. All (5) RS-232 Ports shall be capable of two-way communications.
 14. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
 15. Programmable DACT for either Common Event Reporting or per Point Reporting.
 16. Service Port Modem for dial in passcode access to all fire control panel information.
 17. Connect to ISI unit for reporting of alarm and trouble conditions to the True Site Workstation via radio transmission.
- C. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.
- D. Alphanumeric Display and System Controls: Panel shall include an 80-character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.
1. The system shall have the capability to provide expanded content, multi-line, operator interface displays as indicated on the drawings and specifications. The expanded content multi-line displays shall be Quarter-VGA (QVGA) or larger and be capable of supporting a minimum of 854 standard ASCII characters to minimize or eliminate the levels of navigation required for access to information when responding to critical emergencies and abnormal system conditions. The QVGA operator interface shall provide operator prompts and six context sensitive soft keys for intuitive operation.
 - a) Expanded content, multi-line operator interfaces shall be capable of providing the following functions:
 - (a) Equal or hierarchal priority assignment. In systems with two or more operator interfaces, each operator interface shall be programmable to allow multiple operator interfaces to have equal operation priority or to allow hierarchal priority control to be assigned to individual operator interfaces (locations).
 - (b) Up to 50 custom point detail messages for providing additional point specific information in detailed point status screens.
- E. Voice Alarm: Provide an emergency communication system, integral with the FACP, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:
1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling

- Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface. Each amplifier shall be capable of performing constant supervision for non-alarm audio functions such as background music and general paging.
2. All announcements are made over dedicated, supervised communication lines. All risers shall support Class B wiring for each audio channel.
 3. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.
 4. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.
- F. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):
1. Amplifiers, voice and telephone control circuits
 2. Addressable Signaling Line Circuits
 3. Initiating Device Circuits
 4. Addressable Notification Appliance Circuits
 5. Auxiliary Control Circuits

2.2 REMOTE LCD ANNUNCIATOR:

- A. Provide a remote LCD Annunciator, where required, with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys; Status LEDs and LCD Display as the FACP.
- B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
- C. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
- D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
 1. 40-character custom location label.
 2. Type of device (e.g., smoke, pull station, waterflow).
 3. Point status (e.g., alarm, trouble).
- F. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.
- G. The Remote Annunciator shall be installed in the enclosure with LOC.

2.3 LOCAL OPERATOR CONTROLLER (LOC):

- A. LOC'S shall be located as indicated on the drawings and shall be verified with the Professional prior to rough in.
- B. The LOC shall be housed in a flush or surface mounted steel enclosure as indicated on the drawings. It shall have a continuous hinged lockable door with magnetic door latch.
- C. The LOC shall consist of a microphone, 8 alarm initiating buttons and HVAC shutdown.

2.4 EMERGENCY POWER SUPPLY:

- A. General: Components include battery, charger, and an automatic transfer switch. System shall be powered from the existing emergency generator.
- B. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm notification devices in alarm mode for a period of 15 minutes.

2.5 ADDRESSABLE MANUAL PULL STATIONS:

- A. Description: Addressable single-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

2.6 SMOKE SENSORS:

- A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
 - 1. Factory Nameplate: Serial number and type identification.
 - 2. Operating Voltage: 24 VDC, nominal.
 - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - 4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
 - 5. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
 - 6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
 - 7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device

- at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
8. The sensor's electronics shall be immune from nuisance alarms caused by EMI and RFI.
 9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
 10. Removal of the sensor head for cleaning shall not require the setting of addresses.
- B. Type: Smoke sensors shall be of the photoelectric.
- C. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions for the project. Sensor includes relay as required for fan shutdown.
1. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct smoke sensor shall be provided by the FACP.
 2. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
 3. Duct Housing shall provide a relay control trouble indicator Yellow LED.
 4. Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
 5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
 6. Duct Housing shall provide a magnetic test area and Red sensor status LED.
 7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
 8. Each duct smoke sensor shall have a Remote Test Station with an alarm LED and test switch.
 9. Where indicated provide a NEMA 4X weatherproof duct housing enclosure that shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.7 HEAT SENSORS:

- A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

2.8 ADDRESSABLE CIRCUIT INTERFACE MODULES:

- A. Addressable Circuit Interface Modules: Arrange to monitor or control one or more

system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of AHU systems.

- B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.
- C. There shall be the following types of modules:
 - 1. Type 1: Monitor Circuit Interface Module:
 - a) For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
 - b) For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.
 - 2. Type 2: Line Powered Monitor Circuit Interface Module
 - a) This type of module is an individually addressable module that has both its power and its communications supplied by the two-wire signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.
 - b) This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.
 - 3. Type 5: 4-20 mA Analog Monitor Circuit Interface Module
 - a) This module shall communicate the status of a compatible 4-20 mA sensor to the FACP. The FACP shall annunciate up to three threshold levels, each with custom action message; display and archive actual sensor analog levels; and permit sensor calibration date recording.
- D. All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.9 MAGNETIC DOOR HOLDERS:

- A. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall

operate from a 120VAC, a 24VAC or a 24VDC source, and develop a minimum of 25 lbs. holding force.

B. Material and Finish: Match door hardware.

2.10 ADDRESSABLE ALARM NOTIFICATION APPLIANCES:

A. The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).

1. Addressable Notification appliance operation shall provide power, supervision and separate control of horns and strobes over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.
2. Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable "T" Tapping shall be permitted. Up to 63 appliances can be supported on a single channel.
3. Each Addressable notification appliance shall contain an electronic module and a selectable address setting to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall provide verification of communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.
4. Addressable Controller: Addressable Controller shall supervise Channel (SLC) wiring, communicate with and control addressable notification appliances.
5. Visible/Only Devices (V/O): Provide combination Clear and Amber addressable strobe devices. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

B. ADDRESSABLE APPLIANCES NAC POWER EXTENDER

1. The Addressable Controller shall be a stand-alone panel capable of powering a minimum of 3 Signaling line circuits. Each channel shall be rated for 2.5 amps and support up to 63 addressable notification appliances. Power and communication for the notification appliances shall be provided on the same pair of wires. Addressable SLC notification appliance circuits shall be Class B, Style 4.
2. The internal power supply & battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.
3. The NAC extender panel may be mounted close to the host control panel or can be remotely located.

C. Speaker: Speaker notification appliances shall be listed to UL 1480.

1. The speaker shall operate on a standard 70.7VRMS NAC using twisted / shielded wire.
2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet. Outdoor speakers shall be capable of being tapped up to 15W.
3. The speaker shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
4. The Speaker installs directly to a 4" square, 1 ½" deep electrical box with 1 ½" extension.

D. Accessories: The contractor shall furnish any necessary accessories.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL:

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 1. Factory trained and certified personnel.
 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
 3. Personnel licensed or certified by state or local authority.

3.2 EQUIPMENT INSTALLATION:

- A. Furnish and install a complete Fire Alarm System and Mass Notification as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
- B. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.
- C. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.
- D. Install manual station with operating handle 48 inches (1.22 m) above floor. Install wall mounted audible and visual notification appliances not less than 80 inches (2.03 m) above floor to bottom of lens and not greater than 96 inches (2.44 m) above floor to bottom of lens.
- E. Mount outlet box for electric door holder to withstand 80 pounds pulling force.
- F. Make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, duct smoke detectors.
- G. Automatic Detector Installation: Conform to NFPA 72.

3.3 WIRING INSTALLATION:

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
- D. Mount end-of-line device in box with last device or separate box adjacent to last device for Class "B" supervision.

3.4 FIELD QUALITY CONTROL:

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - 1. Factory trained and certified.
 - 2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - 3. Certified by a state or local authority.
 - 4. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning
- D. Inspection:
 - 1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
 - 2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
- E. Acceptance Operational Tests:
 - 1. Perform operational system tests to verify conformance with specifications:
 - a) Each alarm initiating device installed shall be operationally tested. Each device shall be tested for alarm and trouble conditions. Contractor shall submit a written certification that the Fire Alarm System installation is complete including all punch-list items. Test battery operated emergency power supply. Test emergency power supply to minimum durations specified. Test Supervising

Station Signal Transmitter. Coordinate testing with Supervising Station monitoring firm/entity.

- b) Test each Notification Appliance installed for proper operation. Submit written report indicating sound pressure levels at specified distances.
- c) Test Fire Alarm Control Panel and Remote Annunciator.

3.5 TRAINING:

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Government's maintenance personnel as specified below.
 - 1. Train Government's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
 - 2. Schedule training with the Government at least seven days in advance.

END OF SECTION 28 31 05

**SECTION 31 11 00
CLEARING AND GRUBBING**

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This item shall consist of the removal and satisfactory disposal of trees, **except those that may be designated to remain in place**, stumps, logs, snags, brush, weeds, grass, and other perishable or objectionable material within the limits of project site or along the length of the project as designated.
- B. This work shall include the stripping and stockpiling of topsoil, stump removal, felling of trees, clearing of brush and other operations as may be detailed herein or indicated on the Plans.

PART 2 - MATERIALS

2-01 GENERAL

- A. Materials cleared from the site, including merchantable timber, if any, shall become the property of the CONTRACTOR for his disposal unless otherwise noted elsewhere in the Specifications.
- B. The Contractor shall provide equipment of whatever nature is needed to complete the work to the satisfaction of the Contracting Officer. Equipment deemed by the Contracting Officer to be inadequate for the work must be removed from the site.

PART 3 - EXECUTION

3-01 GENERAL

- A. Clearing and grubbing shall be completed a satisfactory distance in advance of earthwork for site preparation, roadways, pipe laying operations etc. and such operations shall not be started until the cleared and grubbed area has been reviewed by the Contracting Officer.
- B. The Contractor shall be responsible for obtaining permits for hauling, dumping, burning, disposal and other operations, as may be required by Local, State and Federal requirements.

3-02 CLEARING AND GRUBBING

- A. The area within the construction limits of the project site shall be cleared of trees, stumps, roots, logs, vegetation and other objectionable matter. Roots over 1-1/2 inches in diameter shall be grubbed out to a minimum depth of 18 inches below original ground or 12 inches below the proposed finished grade in excavated areas. **Where indicated on the Plans or directed by the Contracting Officer, trees that are to remain in place within the project limits, shall be protected from damage by other clearing or construction operations.**
- B. Stump holes shall be backfilled and compacted to the density required for subgrades in Section 31 23 23 "Earthwork" where applicable.

- C. When necessary to completely remove grass and small roots from the areas to be covered by earth fill, such as roadways, levees, or other site construction, such areas shall be stripped to sufficient depth to remove same, to the extent directed by the Contracting Officer.
- D. Felling of trees and other clearing operations shall be conducted in a manner that prevents damage to trees that are to remain and to protect existing improvements, structures, utility lines or other items.

3-03 DISPOSAL OF MATERIALS

- A. All merchantable timber shall become the property of the CONTRACTOR for his disposal unless otherwise noted.
- B. Burying of stumps, trees, logs, snags or other vegetative materials will not be permissible within the project site limits unless otherwise provided for in these Specifications.
- C. All perishable material shall be completely removed from Government property to disposal areas provided by the Contractor and approved by the Contracting Officer. On-site burning of materials is not allowed.
- E. Materials which are stripped from the project site which are not suitable for reuse shall be disposed of by the Contractor at a location provided by him and approved by the Contracting Officer.
- F. All cost of hauling, stockpiling and disposal of material shall be included in the Contract Price bid price.

**SECTION 31 23 23
EARTHWORK**

PART 1 GENERAL

1-01 DESCRIPTION

- A. This work shall consist of general grading, excavating, site preparation, hauling, placing, processing, filling, spreading, compacting, and protecting areas to be filled in accordance with these Contract Documents and the MISSISSIPPI STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2004 EDITION and in conformity with the lines, grades, slopes, and typical cross sections depicted by the Contract Documents.
- B. This item shall also consist of satisfactorily stockpiling materials or disposing of all unsatisfactory materials encountered within the construction limits of the project site. The work includes grading and subgrade construction on streets, roadways, and parking areas, drainage ditch and channel construction, water and sewer main construction and site work for wells, tanks, pumping stations, etc.

1-02 EXAMINATION OF SITE

- A. The Contractor shall visit the site and inform himself fully of the amount of excavation, filling and grading required under the Contract.
- B. The Contractor shall fully familiarize himself with the surrounding area and the conditions of access under which the project is to be completed.

1-03 CLASSIFICATION OF EXCAVATION

- A. Required excavation shall be identified as Unclassified Excavation, Undercut Subgrade, Channel Excavation, Borrow Excavation (Owner furnished or Contractor furnished), Structure Excavation, as required for construction of the project, and as described in the Geotechnical Report. All work shall conform to the recommendations of the Geotechnical Report.
- B. Unclassified Excavation: Unclassified excavation will consist of all excavation materials of whatever character encountered in the work except for those classes described herein.
- C. Undercut Excavation: Undercut excavation shall consist of the removal and disposal of deposits of soils and organic matter not suitable for foundation or subgrade material as determined by the Contracting Officer and satisfactorily disposing of materials on or off-site.

Undercut excavation shall include materials which will decay or produce unsatisfactory subsidence in the embankment, pipe or structural bedding. Undercut excavation may be made up of decaying stumps, roots, logs, humus, highly plastic clay (CH), or other unsatisfactory material.

- D. Channel and Ditch Excavation: Excavation of drainage ways shall consist of excavating all earthen materials and shaping the channel to the neat lines, grades and typical sections required for the various type sections of channel improvements proposed. Channel and ditch excavation shall include the hauling, spreading, placing, processing, compacting, or disposal of all excavated material.

Channel excavation shall be that required to improve or relocate existing channels.

Ditch excavation shall be that required to construct upstream and downstream channels for pipe culverts or for the excavation of drainage swales.

- E. Borrow Excavation: Borrow excavation shall consist of the removal, hauling, placing, processing, shaping, and compacting of approved select on-site material at the location directed by the Contracting Officer.
- F. Structure Excavation: Structure excavation shall consist of the removal of all material to the dimensions and depths, shown in the Contract Documents or as directed by the Contracting Officer, necessary for the construction of structures and the installation of other items. It shall also include, as necessary, all dewatering, pumping, bailing, drainage, cribbing, sheeting and other foundation work; and should include backfilling and the proper disposal of all excavated material as directed.

PART 2 MATERIALS

2-01 EQUIPMENT

- A. Contractor may use the type of earth moving, compaction, processing, and watering equipment that he desires or has at his disposal, provided the equipment is in satisfactory condition, of adequate design to perform the work efficiently, and is of such capacity and quantity that the construction schedule can be maintained as planned by the Contractor and approved by the Contracting Officer in accordance with the Contract Time contained in the Contract. The Contractor shall furnish, operate and maintain such equipment as is necessary to control uniform density, layers of fill and cross sections.

2-02 MATERIALS

- A. Foundation Construction, Roadway Construction and Backfill Behind Curb: Material for fills shall consist of material obtained from the excavation of on site banks, borrow pits or approved off-site sources. The material used shall be free from vegetable matter and other deleterious substances and shall not contain large rocks or lumps. Fill materials shall consist of select, nonorganic and debris-free silty clays (CL) or sandy clays (CL) having a plasticity index (PI) within the range of 10 to 24 and a liquid limit less than 45 or silty and clayey sands (SM, SC) with a PI between 3 to 15 and liquid limit less than 35. Fill material should extend a minimum 5 feet horizontally beyond the proposed structure, where capable.

PART 3 EXECUTION

3-01 GENERAL REQUIREMENTS

- A. Suitable materials excavated in project site construction shall be used insofar as practicable in the formation of fills, subgrades and shoulders as shown in the Contract Documents. When suitable material is not needed for fills on the site, it shall be placed on other areas designated by the Contracting Officer and in accordance with subparagraph "I" hereof.
- B. Sequence of Operations: No site construction shall be started until sufficient clearing, grubbing, stripping and adequate pipe and drainage work to allow proper drainage within construction limits has been satisfactorily completed to allow earthwork to proceed without interruption.

C. Site and pavement Subgrade Preparation

1. Prior to placing material on areas to receive fill, the existing ground shall be thoroughly proof-rolled with a roller to prove that the area is of a satisfactory density with stability to begin placement of fill material. Stability shall be determined by proof-rolling with loaded dump trucks or other suitable equipment by the Contractor. At least two (2) full coverage passes over the site should be performed. Any areas that are soft or yielding during proof-rolling should be processed (spread, scarify, water, or dry) to compact with stability or undercut, filled, and compacted with suitable material as directed by the Contracting Officer.
2. Prior to any pavement construction, any debris, organics and humus matter encountered during excavation should be removed from areas supporting structures or receiving fill placement prior to construction. After all debris, organics or humus matter are removed, the existing soil subgrade should be excavated to a depth of 12 inches, mixed and re-compacted.

D. Foundation Preparation:

1. Prior to foundation construction, the building foundation areas are to be excavated to proposed foundation bearing elevation. During demolition and excavation and prior to fill placement or foundation construction, asphalt pavement, any debris, organics and humus matter encountered on-site should be removed from areas supporting structures or receiving fill placement prior to construction. After all necessary demolition and excavations are complete in within the building footprint, the existing in-place soils at foundation bearing elevations should be scarified to a minimum depth of 12 inches and re-compacted. Any soft or unstable areas encountered during re-compaction may require remediation. Remediation of soft or unstable areas may consist of re-mixing, moisture conditioning, over-excavation, and/or geotextile reinforcement, but should be determined on a case-by-case basis by the engineer. The site should be inspected by the geotechnical engineer or his representative after excavation and site preparation is complete.
2. In areas which will support structures, the soil subgrade and any necessary fill placement should be compacted to a minimum of 98% of maximum dry density per Standard Proctor (ASTM-D698). Compaction should be achieved in maximum loose lifts of 5 inches at a moisture content comparable ($\pm 3.0\%$) to the optimum moisture content established in the laboratory and compaction verified with each lift. A minimum of two density tests should be performed every lift per building. Fill placement adjacent to existing slopes should be stepped or benched into all slopes exceeding two vertical feet of fill placement in a manner to facilitate adequate compaction.

E. Excavation:

Excavation shall be performed at locations indicated in the Contract Document, to lines, grades and cross sections shown, and shall be made in such manner that fills can be formed in accordance with the requirements herein. Suitable material encountered within the limits indicated shall be used in the formation of fills. Material not approved for use in fills shall be disposed of on site if so directed by the Contracting Officer. During the process of excavation, the grade shall be maintained to assure that it will be well drained at all times.

1. The non-organic, non-high plasticity clay debris-free soils removed from the excavated areas should be suitable for use in the embankment. All suitable materials removed from the required excavations shall be utilized in construction of embankments, fills, and backfill for

undercut areas as designated in the Contract Documents. The Contractor shall organize the excavation and fill such that on-site materials from excavated areas can be used for fill. Excess materials (suitable or unsuitable) shall be wasted or disposed of on-site as directed by the Contracting Officer. No separate payment will be considered for the disposal of excess materials (suitable or unsuitable). Grading of excess materials shall be such to prevent ponding of water and to slopes that will prevent erosion. Vegetative cover shall be established on all spoil areas at no additional cost to the Owner.

The Contractor shall control the excavation work so that the ground surface is properly pitched to prevent water from running into the excavated areas. Water that has accumulated in the excavated areas shall be promptly removed by the Contractor at his expense. The contractor is required to maintain the water level a minimum of two (2) feet below the base of excavations.

2. Undercutting: When objectionable material not suitable for foundation or subgrade material as determined by the Contracting Officer remains after clearing, grubbing, stripping, and earthwork operations, in areas for subgrade or foundation construction, the Contractor will undercut such material to such depth and extent as directed and backfill with suitable material. This shall not relieve the Contractor of his obligation to process suitable but wet soils for use in embankment as directed by the Contracting Officer. Fill material shall be placed in uniform layers and compacted as specified for fills. Undercut materials shall be disposed of and fill material obtained as directed by the Contracting Officer.
3. Tolerances: Excavation and grading shall be completed to conform to the lines and grades shown in the Contract Documents. The surface shall conform to the specified grades within 0.5 inches, unless a different tolerance is indicated by the Contract Documents. Deviations shall be corrected by further grading, filling, reshaping and compacting until conformance is obtained.

F. Formation of Fills:

1. Fills for project site shall be constructed to lines, grades, cross sections and dimensions shown in the Contract Documents.
2. Earthfills shall be formed by distributing the materials in successive uniform horizontal layers not to exceed nine inches (9") in thickness, loose depth, for the full width of the cross sections. Each layer of fill shall be compacted to a density of at least ninety-five percent (95%) of standard Proctor maximum dry density at moisture contents within 3 percentage points of the optimum water content. The Contractor shall spread, scarify, water, or dry the material to achieve the required moisture content. Stability shall be determined by proof-rolling performed by the Contractor.
3. The upper surface of the fill shall be shaped to provide complete drainage of surface water at all times. The forming of ruts will not be permitted. The Contractor shall protect the work from erosion and adverse weather conditions.
4. Each layer of earthfill shall be compacted as required, with appropriate equipment. Fill material shall be compacted within three percent (3%) of optimum moisture content by processing to dry or watered and properly mixed as needed before being rolled. The furnishing and application of water for construction of fills or processing to dry soils will not be paid for separately; such operations shall be considered as incidental to the formation of fills.

5. Construction operations shall be performed in such manner that the simultaneous rolling and placing of material in the same lane or section will not occur. To avoid uneven compaction, the hauling equipment shall traverse, as much as possible, the full width of the cross section. Each layer shall be compacted as required before material for the next layer is deposited.
 6. Fills and embankments will not be paid for as a separate item. The cost of making fills shall be made at the Contract Unit Price specified on the Bid Form for unclassified excavation unless otherwise noted.
- G. Subgrade Preparation: Subgrade preparation as specified in this section shall ordinarily apply to the graded section prior to the placing of a course of selected material such as base material.

Materials shall not be deposited on the prepared subgrade until it has been checked and approved by the Contracting Officer. When practicable, such prepared subgrade shall be maintained free from ruts and depressions, adequately drained and in a smooth and compacted condition. Damaged subgrade shall be reshaped, recompacted and approved by the Contracting Officer prior to use.

1. As required by the Contract Documents and established in the Proposal, all silty and clayey soils in the finished subgrade shall be treated with lime in accordance with the Specifications. These soils are defined as silty or sandy clays (CL and CL-ML) and silts (ML). Delineation of the areas requiring lime will require close inspection by the Contractor and Contracting Officer. Exposed silty and clayey soils shall be treated to a minimum depth of six inches (6") in the final subgrade level. The Contractor shall treat to the depth required to provide a 6" treated subgrade.
2. When the subgrade material is thoroughly and completely mixed and at the proper moisture content for compaction (as specified by the Contracting Officer), the roadbed or foundation shall be machined and the subgrade material shaped in such a manner that after full compaction, the finished subgrade course shall be the width indicated and closely conform to the lines, grades, and typical section shown in the Contract Documents or as specified.

The Contractor shall guard against all irregularities in shape or section and loss of crown or segregation of materials. Proper drainage shall be maintained at all times.

3. After shaping has been completed and the material is at plus or minus three percent (3%) of the optimum moisture content, the subgrade shall be compacted in accordance with the provisions and requirements specified hereinafter.

Compaction shall be accomplished by rolling with the sheepfoot rollers and pneumatic-tired traffic rollers of the type heretofore specified. Compaction shall begin at the bottom and continue until the entire area is thoroughly compacted to at least 95 percent (95%) of Standard Proctor maximum dry density with stability present (ASTM D 698). Stability shall be determined by proof-rolling performed by the Contractor. During the compacting, the subgrade shall be maintained at the proper section by light machining or dragging and at the proper moisture content. Final rolling shall be accomplished with pneumatic tired rollers.

4. Lack of uniformity in the mixture, inequalities in the surface or other irregularities shall be corrected by adding or replacing materials and remixing, reshaping, and recompacting as necessary and required.

The Contractor shall be responsible for producing a subgrade, the surface of which shall present a uniform appearance and a smooth riding surface, without sharp breaks or depressions which will collect or hold water. The finished grade and typical section shall be as close to that shown in the Contract Documents as can be constructed with proper and expert manipulation of a motor grader. In no case shall be maximum variation (when tested with a ten foot (10') straight-edge parallel to the centerline) be more than one-fourth inch (1/4").

5. The compacted subgrade will be tested for specified compaction and thickness before acceptance. No minus tolerance in base thickness will be allowed. No density below that specified above will be accepted.

Any areas which do not meet the above requirements shall be corrected by means satisfactory to the Contracting Officer, including rebuilding where necessary.

- H. Channel and Ditch Excavation and Grading: Channel and Ditch excavation shall be performed in proper sequence with other construction. Satisfactory materials shall be placed in fills as needed. Unsatisfactory material shall be wasted in disposal areas. Ditches shall be graded to drain and shall not contain low spots which would hold water. Ditches and slopes shall be dressed to a tolerance of plus or minus 0.1 foot from indicated grade.
- I. Foundations: Excavation for structural foundations shall be made at slopes which will provide safe working conditions, or adequate sheet piling shall be installed. Where the recommendations of a geotechnical evaluation are included in the Contract Documents, Contractor shall follow said recommendations. Backfill material shall not contain any expansive materials and shall be compacted in lifts to ninety-eight percent (98%) of standard Proctor maximum dry density with stability present (ASTM D 698).
- J. Disposal of Excess Material: All excess material and material unsuitable for use in fills shall be disposed of as directed by the Contracting Officer, in designated on-site or off-site areas. Material disposed of on-site shall be placed and graded to field established contours and elevations. After placement of excess material, such fills shall be consolidated by complete coverages with construction equipment. Fills shall be dressed to present a neat appearance before project acceptance. Slopes shall be such that water does not pond but erosion control shall be maintained. Vegetative cover shall be established on all spoil areas at no additional cost to the Owner.

3-02 SEASONAL AND WEATHER LIMITS

- A. No fill material shall be placed, spread or rolled while the ground or fill is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until the moisture content and density of the fill are as previously specified.

3-03 TESTING

- A. Contractor shall be responsible for determining that material utilized in fills meet project requirements and shall provide Atterburg Units, Gradation, Standard Proctor density tests, field density tests, etc. for on-site and off-site materials utilized in fills, foundations or bases. Proctors shall be run as frequently as necessary to assure consistency of material and wherever changes in material are encountered.
- B. Density tests shall be performed at not less than the following interval:
 - 1. Foundation Backfill - at least in every second lift of vertical fill, or every 100 CY, whichever is more frequent.
 - 2. Subgrade Fills - at least in every second lift of vertical fill in a maximum of 500 linear feet, or every 2000 cubic yards, whichever is more frequent.
 - 3. Road and Street Bases - in every lift of each day's production, with spacing in each lift not to exceed 300 feet, and with total yardage per test not to exceed 2000 cubic yards.
- B. Testing shall be performed by an independent testing laboratory, which shall submit test results to the Contracting Officer for review. Contractor shall pay testing costs.

End of Section

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**SECTION 31 25 00
EROSION CONTROL**

PART 1 GENERAL

1-01 DESCRIPTION

- A. General: This item consists of preparing the ground surface, furnishing and applying fertilizer and lime, furnishing and sowing grass seeds, furnishing and placing grass sod on prepared areas, finishing, compacting, watering, establishing and repairing same in accordance with these Specifications at the locations shown on the plans or as directed by the Engineer.
- B. Seeding: This work shall consist of furnishing the specified kind and variety of seeds and seed treatment materials, treating and planting the seeds in a prepared and approved seedbed; covering the seeds and compacting the seedbed; and providing plant establishment, in accordance with these Specifications and in the locations shown on the Drawings or as established by the Engineer.
- C. Fertilizing: This work shall consist of furnishing, transporting, spreading, and incorporating fertilizers of the type and in the amount designated into the prepared ground in the locations shown on the plans.
- D. Sodding: This work shall consist of supplying, transporting and placing live, viable sod of the types required in the locations specified on the plans.
- E. Mulching: This work shall consist of furnishing, transporting and placing asphalt coated or mechanically stabilized vegetative mulch on seeded areas of slopes, shoulders, medians and other areas indicated on the plans, or as designated by the Engineer.
- F. Lime: This work shall consist of furnishing, transporting, and placing lime on slopes, shoulders, ROW, and other areas as directed by the Engineer.

PART 2 MATERIALS

2-01 SEED

- A. Seeds shall meet the requirements of the Seed Laws of the State of Mississippi and shall be tested in accordance with the U.S.D.A guidelines. The seed shall be delivered in bags or containers bearing seed certification tags and other identification showing percent germination and purity of the seed.
- B. Bermuda seed shall be common, hulled, fresh, clean, new crop seed testing at least 95% for purity and 85% for germination.
- C. Crimson Clover seed shall be fresh, clean, new crop seed testing at least 98% for purity and 85% for germination.

2-02 FERTILIZER

A. Fertilizer shall be an approved commercial grade containing nitrogen, phosphorus and potash and shall be delivered accompanied by identification of the brand and grade being furnished. Fertilizer may be furnished in bulk, in bags or other approved containers.

B. Unless otherwise specified, fertilizer shall be dry granular grade 13-13-13 (triple thirteen) containing equal parts of nitrogen, phosphorus and potash, respectively.

2-03 SOD

A. Sod shall be produced by a commercial sod farm located as close to the contract work as possible. Sod shall be a live, fresh, growing grass mat at least two (2) inches in thickness with soil adhering firmly to the roots. The sod shall be reasonably free from weeds and other grasses. Sod may be delivered in standard blocks neatly stacked on pallets or in rolls.

B. Sod, unless otherwise required, shall be of the variety growing in the location to be sodded. Where little or no identifiable native grass can be found, sod shall be common bermuda.

2-04 MULCH

A. Mulch shall be Class I vegetative material consisting of approved baled straw from cereal grain or common native hay crops in accordance with Section 215 and 715 of the MDOT Standard Specifications. The mulch shall have been cured properly prior to baling and shall be reasonably free of foreign grasses and weeds. All straw material shall be approved by the Engineer prior to use.

B. Where specified on the plans or called for in the Proposal, mulch shall be bituminous coated with Grade SS-1 emulsified asphalt in accordance with Section 702 of the MSHD Standard Specifications.

2-05 LIME

A. Lime shall be dry, native, crushed agricultural rock limestone reasonably free from rock, gravel, dirt, clay, roots and other objectionable material. Lime may be furnished in bulk, in bags or other approved containers.

2-06 EQUIPMENT

A. The Contractor shall provide tractors, trucks, discs, harrows, drags, drills, sprayers, blowers and other incidental equipment as needed to properly place and install the seed, sod, fertilizer, water, lime, compact, grade, mulch and establish a living turf in the areas shown on the Drawings in accordance with these Specifications.

2-07 WATER

A. Fresh, clean potable water shall be provided and used by the Contractor.

PART 3 EXECUTION

3-01 GENERAL

A. Ground Preparation, Fertilizing and Liming:

1. The area to be planted shall be disced and prepared to a depth of at least four (4) inches. The specified amount of fertilizer and lime shall be applied uniformly over the surface and harrowed lightly so that it will be incorporated into the upper two (2) inches of the soil. If the soil is not moist, it shall be watered until it is in workable condition.
2. The completed area to be planted shall present a smooth, uniform surface true to line and cross section. Planting shall follow immediately.

B. Protection: The Contractor shall be responsible for maintaining and protecting seeded, sodded, mulched areas until final acceptance of the project. He shall take every precaution to prevent unnecessary foot and vehicular traffic and shall repair and restore damaged areas immediately, without extra compensation.

C. Maintenance:

1. The Contractor shall maintain the grassed areas until final acceptance of the work. Maintenance shall consist of refertilizing, watering, preserving, protecting, replacing, and such work as may be necessary to keep the seeded or sodded areas growing in a satisfactory condition.
2. The Contractor shall be responsible for satisfactory growth of the grass, and until final acceptance he will be required to water and mow the grass at such intervals as will insure a living and growing sod at the time of acceptance. A "living and growing sod" shall be interpreted to include sod that is seasonably dormant during the cold or dry season with roots that have taken hold in the topsoil and capable of growing off after the dormant period.

3-02 SEEDING

A. General: Seeding shall be accomplished with approved seed at the rates recommended for the mixes and between the dates designated below:

Mixture No. 1 (March 01 to August 31)

1. Common Bermuda Grass @ 15 lbs/acre

Mixture No. 2 (September 01 to November 15)

1. Common Bermuda Grass @ 15 lbs/acre
2. Crimson Clover @ 20 lbs/acre

B. No seeding shall be done during windy weather or when the ground is frozen, wet or otherwise in a nontillable condition. Full advantage shall be taken of time and weather conditions best suited for seeding, and such time of seeding shall be subject to the approval of the Engineer.

- C. The seeds shall be sown uniformly in the specified amounts, preferably by approved mechanical seeders, and immediately rolled with a cultipacker or other satisfactory equipment; or covered lightly with soil by the use of garden rakes, or other approved methods.

3-03 FERTILIZING

- A. Fertilizer shall be spread uniformly at the rate specified preferably by mechanical methods. Lumps shall be broken as specified by the Engineer, where found objectionable.
- B. Application: 500 lbs/acre unless otherwise specified.

3-04 SODDING

- A. General: Solid sod shall only be placed when weather and soil conditions are deemed, by the ENGINEER, to be suitable for proper placement and growth.
- B. The solid sod shall be placed on the prepared surface with the edges in close contact. Cracks between blocks or strips of solid sod shall be closed with small pieces of fresh sod and cracks too small for sod shall be filled by a light dressing of topsoil. The entire sodded area shall then be compacted and watered to the satisfaction of the Engineer. Rollers, hand tamps or other approved equipment may be used for compacting.
- C. Surfaces of solid sodding which, in the opinion of the Engineer, may slide due to the height and slope of the surface or nature of the soil, shall, upon direction of the Engineer, be "pegged" with wooden pegs driven through the sod blocks into firm earth, sufficiently close to hold the sod in place.

3-05 MULCHING

- A. Equipment:

When anchoring mulch with bituminous material, the approved equipment shall be capable of maintaining a constant air stream which will blow or eject controlled quantities of asphalt coated mulch in a uniform pattern. A jet or spray nozzle for applying uniform, controlled amounts of asphalt to the vegetative material as it is ejected shall be located at or near the discharge spout. The amount of asphalt applied shall be sufficient to provide a spotty tack at the time of mulch placement. The discharge shall be kept at a relatively high angle to permit the coated mulch to fall properly in place.

- B. Mulching shall be placed uniformly on designated areas within twenty four (24) hours following the planting of spot sod, sod, or seeds, as applicable, unless weather conditions are such that mulching cannot be performed. Placement shall begin on the windward side of areas and from top of slopes. In its final position the mulch shall be loose enough to allow air to circulate but compact enough to partially shade the ground and reduce erosion. Mulch shall be bituminous coated where specified on the plans. The baled material shall be loosened and broken thoroughly before it is fed into the machine to avoid placement of unbroken clumps.

- C. Application Rate: Two (2) tons of mulch per acre. If bituminous material is used, the rate of application shall be 150 gallons emulsified asphalt per acre.

3-06 LIMING

- A. General: Agricultural lime shall be spread uniformly at the rate specified, preferably by mechanical methods. Lumps shall be broken as specified by the Engineer where found objectionable.
- B. Application Rate: Two (2) tons per acre unless otherwise specified.

PART 4 COMPENSATION

4-01 MEASUREMENT

- A. Erosion Control, when listed on the Bid Form, will be measured in the units indicated for established turf. No additional measurement will be made of areas requiring reapplication or rework by the Contractor.
- B. Solid Sod, when listed on the Bid Form, will be measured in the units indicated for established turf. No additional measurement will be made of areas requiring reapplication or rework by the Contractor.
- C. No measurement or payment shall be made for seeding, sodding or repairs to areas disturbed outside of the right-of-way limits or outside the temporary construction limits.

4-02 PAYMENT

- A. Where listed on the Bid Form, Erosion Control shall be paid for at the Contract Unit Price specified, which shall include all labor, materials, testing and equipment required to establish a healthy turf. Where erosion control is not listed or is indicated to be a subsidiary item to a site or Facility, erosion control will not be paid for separately but should be considered absorbed in the Contract Price for the site or Facility.
- B. Where listed on the Bid Form, Solid Sod shall be paid for at the Contract Unit Price specified, which shall include all labor, materials, testing and equipment required to establish a healthy turf. Where Solid Sod is not listed or is indicated to be a subsidiary item to a site or Facility, it shall not be paid for separately but should be considered absorbed in the Contract Price for the site or Facility.
- C. Watering, maintenance, protection, mowing and other work subsidiary to completion of the erosion control specified herein shall not be measured and no separate payment shall be made for such items.

End of Section

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SECTION 32 11 23
CRUSHED LIMESTONE BASE COURSE

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This item shall consist of furnishing all materials, labor, equipment and performing all work necessary for the construction of a limestone base course on a prepared subgrade in accordance with the lines and grades shown on the CONTRACT DRAWINGS and the requirements of these SPECIFICATIONS.
- B. Where directed, limestone base courses shall be installed for use as temporary access and as permanent gravel drives, roadways, roadway bases and shoulders, utility trench repairs, bases and site surfaces for wells, tanks, pumping stations and metering stations etc., with a compacted finished thickness as required by the Contract Drawings.

1-02 APPLICABLE DOCUMENTS

- A. The latest edition of the following publications forms a part of this Specification and where referred to by basic designation only, are applicable to the extent indicated.
- B. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. T96 Resistance to Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
 - 2. AASHTO T 99 Moisture-Density Relations of Soils Using a 5.5-lb. Hammer and a 12-inch Drop
- C. **Mississippi Standard Specifications for Road and Bridge Construction, 2004 Edition.**
- D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM C 29 (1991a) Unit Weight and Voids in Aggregate
 - 2. ASTM C 88 (1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - 3. ASTM C 117 (1995) Materials Finer than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
 - 4. ASTM C 131 (1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - 5. ASTM C 136 (1995a) Sieve Analysis of Fine and Coarse Aggregates

6. ASTM D 75 (1987; R 1992) Sampling Aggregates
7. ASTM D 1556 (1990) Density and Unit Weight of Soil in Place by the SandCone Method
8. ASTM D 1557 (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
9. ASTM D 2487 (1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
10. ASTM D 2922 (1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
11. ASTM D 3017 (1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
12. ASTM D 4318 (1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
13. ASTM E 11 (1995) Wire-Cloth Sieves for Testing Purposes
14. ASTM E 548 (1994) General Criteria Used for Evaluating Laboratory Competence

PART 2 - MATERIAL

2-01 GENERAL

- A. Crushed limestone shall meet the gradation of the following table.

CRUSHED STONE GRADATION LIMITS	
Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
3/4 inch	70-100
1/2 inch	62-90
3/8 inch	50-80
No. 4	40-65
No. 40	12-26
No. 200	5-12

- B. The portion of the crushed stone passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index of not greater than 5.

2-02 SOURCE AND TESTING

- A. The limestone base material shall be obtained from a source to be furnished by the CONTRACTOR and reviewed by the Engineer. The CONTRACTOR shall designate his proposed source and shall submit certified test results to the Engineer for approval prior to starting the placement of the material on the project.
- B. Testing shall be completed as specified herein and as directed by the Engineer. Tests shall be completed by a certified laboratory approved by the Engineer and results shall be submitted in duplicate to the Engineer. Testing shall be an absorbed cost item.

PART 3 - EXECUTION

3-01 GENERAL REQUIREMENTS A. Subgrade:

Prior to placing base course material, the subgrade surface shall be checked by the ENGINEER. Any ruts or soft yielding places that appear by reason of poor drainage conditions, hauling or from any other cause shall be corrected, rolled to required compaction and shaped before the base course is placed thereon. B. Placing and Spreading:

Base course material may be spread in one or two equal lifts. The base material shall be deposited and spread in a uniform layer without appreciable segregation of the material. Addition of water or drying will be required as needed to produce a material which can be compacted to the required density.

C. Compacting:

Base course compaction may be performed with sheepfoot, pneumatic or steelwheeled rollers, or a combination of rollers; however, if the equipment and product selected by the CONTRACTOR proves to be unsatisfactory, the ENGINEER may order the CONTRACTOR in writing to make the necessary revisions. Compaction equipment found to be in poor condition by the ENGINEER may be ordered replaced. Final rolling shall be accomplished with a pneumatic or steel-wheeled roller.

- 1. Each layer of base material shall be rolled and compacted to a density of 100% of standard Proctor density at moisture contents within 2 percentage points of the optimum water content.
- 2. Irregularities or depressions that develop under rolling shall be corrected by loosening the material at such places and adding or removing materials.

During the rolling operations the shape of the base course shall be maintained by blading.

D. Surface and Thickness Requirements:

The surface of the completed base shall present a uniform appearance and smooth surface without sharp breaks or depressions which will hold water. The finished grade and typical section shall be as close to that shown on the CONTRACT DRAWINGS as can be constructed with proper and expert manipulation of a motor grader to within plus or minus one half (.5) inch of true grade. The thickness of the completed base course shall not vary more than one half (0.5) inch from that shown on the DRAWINGS.

3-02 MAINTENANCE

- A. The base material shall be maintained by watering, light blading and rolling, when required, in order to prevent loss of material and in order to preserve the line, grades and cross sections of the construction.
- B. Maintenance shall continue until acceptance of the project. Provide additional material as directed by the Engineer to fill low areas as needed to maintain grades.

3-03 SUBMITTAL DATA

- A. Submit certified gradation test results for review. Designate source of supply. Submit subgrade compaction analyses to the Engineer.

3-04 TRENCH LIMITATIONS

Whenever utility improvements are to be located along or across an improved surface, the width of the trench shall be held as nearly as possible to the maximum width specified below. Where brick or concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut shall exceed the actual width of the top of the trench by twelve inches (12") on each side or a total of two feet (2'). Exposed surfaces of Portland cement or asphaltic concrete shall be cut with a pavement saw before breaking. Care shall be taken in cutting to insure that a straight joint is sawed.

NOMINAL PIPE DIAMETER (INCHES)	MAXIMUM TRENCH WIDTH (FEET)	MAXIMUM WIDTH OF PERMANENT SURFACE AND CURB & GUTTER REMOVAL (FEET)
6 or less	5.00	7.00
8-18	5.00	7.00
21-24	6.00	8.00
27 or greater	7.00	9.00

END OF SECTION

**SECTION 32 13 13
CONCRETE DRIVES AND APRONS**

PART 1 GENERAL

1-01 DESCRIPTION

- A. This item covers the installation of drives and aprons constructed of Portland Cement Concrete with steel reinforcement in accordance with the details, dimensions and typical cross section and to the lines and grades as shown on the Contract Documents or established by the Contracting Officer.
- B. Refer to Section 03 30 00 herein for details concerning cement, reinforcement and other work.

PART 2 MATERIALS

2-01 GENERAL

- A. Insofar as applicable, all material shall meet the requirements specified in Section 03 30 00. Concrete for this construction shall be Class "C" unless otherwise specified. The compressive strength of the cement when tested at 28 days age shall be 3500 pounds per square inch, minimum. The water/cement ration shall in no case exceed the maximum allowed in the design mix.
- B. Expansion joint filler shall be premolded bituminous fiber board of the nonextruding resilient type as specified.

PART 3 EXECUTION

3-01 SUBGRADE PREPARATION

- A. The existing soil of the subbase shall be scarified to a depth of 12" below top of subgrade elevation and re-compacted.
- B. The base shall consist of 6.5" of Dense Graded Crushed Limestone (MDOT Gradation No. 610 or 825-B) compacted to a minimum 95% maximum dry per Standard Proctor.
- C. Loose rocks or pieces of broken concrete shall be buried to a depth of at least 18 inches below the subgrade elevation and all holes and depressions backfilled and compacted in 6 inch layers to the specified density.

3-02 FORMS

- A. Metal forms shall be used in all cases unless otherwise specified except that on curves of short radii the Contracting Officer may permit wooden forms for backing flexible materials. On normal curves the Contractor shall use flexible steel forms to avoid the effect of broken chords.

- B. Metal forms shall have a flat surface on top for finishing edges of the slabs. All forms shall be securely staked, braced and held firmly against displacement from the required line and shall be sufficiently tight to prevent leakage of mortar.
- C. Metal forms shall be free from rust, grease and old concrete accretions and shall be cleaned after each usage.

3-03 EXPANSION JOINTS

- A. Expansion joint fillers for drives and aprons of the specified thickness shall be placed at intervals not to exceed 30 feet each way in slabs but the spacing shall be adjusted to prevent expansion joint occurring in the center of a driveway. Joint filler shall be performed and shall extend full depth without horizontal joints. Any filler protruding after the concrete is finished shall be neatly trimmed off flush with surface.
- B. Joints shall be 1/2" thick unless otherwise specified.

3-04 PLACING AND FINISHING CONCRETE

- A. The concrete shall be placed on a moist subgrade, deposited to the proper depth, tamped and spaded sufficiently to compact the concrete and to bring the mortar to the surface, after which it shall be finished smooth and even by means of a wood float. Before the concrete is given the final finishing, the surface of the pavement shall be checked with a ten (10) foot straightedge and any irregularities of more than one eighth (1/8) inch in ten (10) feet shall be eliminated.
- B. Concrete drives and aprons shall be constructed true to line, grade and cross section and in uniform sections at the thicknesses specified and the locations indicated on the drawings. The forms on the face of all slabs shall be removed as soon as the concrete will hold its shape and the surface shall be floated with a wooden float to a smooth and even finish, but no plastering will be permitted.
- C. The concrete used in the construction shall be poured with the desired slump and consistency. Any concrete found to have excessive slump and lacking in the desired consistency shall be discarded from use.
- D. The edges on the face of the slab shall be rounded with approved finishing tools having the radii shown on the plans. Edges where expansion joint material has been placed shall be finished with an edging tool having a radius of not over one quarter (1/4) inch. Any exposed surface against which some rigid type of construction is to be made shall be left smooth and uniform so as to permit free movement of the drive or apron.

3-06 REINFORCEMENT

A. Reinforcing steel and wire fabric for drives and aprons shall be installed in accordance with the details shown on the plans.

B. Reinforcement shall conform to the requirements specified in the Section 03 30 00 herein.

3-07 PROTECTION AND CURING

A. Immediately after finishing the concrete, it shall be protected and cured in accordance with the provisions and requirements of Section 03 30 00, herein.

B. Any section which is damaged, before final acceptance of the work, shall be removed and reconstructed by the Contractor without extra compensation.

3-08 BACKFILLING AND CLEANING UP

A. After the concrete has set sufficiently the spaces on the sides of the drive or apron shall be refilled to the required elevation with suitable material, which shall be tamped in layers of not over six (6) inches until firm and solid.

B. All surplus material shall be disposed of as directed and the entire work left in a neat and presentable condition.

END OF SECTION

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**SECTION 32 16 23
SIDEWALKS**

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This Section shall include construction of sidewalks as shown on the Contract Drawings and as specified herein.

1-02 REQUIREMENTS

- A. All work specified in this Section shall conform to the applicable requirements of Section 03 30 00, "Cast-In-Place Concrete", of the Specifications.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. All materials for concrete work shall conform to the applicable requirements of Section 03 30 00, Concrete General.
- B. Base course under concrete walks shall consist of minimum 3" of sand over compacted natural surface soils.

PART 3 - EXECUTION

3-01 CONCRETE WALKS

- A. Construct concrete walks in accordance with Section 03 30 00 and as here specified using 3,000 psi concrete and W1.4x1.4 welded wire mesh reinforcement.
- B. Check tops of forms and sub-grade with a template cut true to the cross section of the proposed construction immediately prior to placing concrete and correct any irregularities. Introduce short vertical curves in walks as shown on the Contract Drawings, or at points where the change in walk grade exceeds 2 per cent.
- C. Provide 1/4 inch per foot cross slope or crown in direction indicated by grading. Make slight adjustment in slopes of walk intersection as necessary to provide proper drainage. The longitudinal surface variations shall be not more than 1/8 inch on a 5 foot transverse section.
- D. Concrete walks and aprons shall be one course construction 4 inches thick minimum and of widths shown on the Contract Drawings.
- E. Provide expansion joints not to exceed thirty (30) feet on center: at all intersections or changes in direction or cross section and where walks abut curbing, building or other structures.

- F. Finish the expansion joints with an edger having a radius of 1/4 inch. Divide the surface of sidewalks into blocks with an approved grooving tool having a groove depth of not less than 1 inch. In walks up to 5 feet wide, space the grooves at intervals equal to the approximate width of the walk. In walks over 5 feet wide, space the grooves at intervals approximately 1/2 the width of the walk and in addition provide a longitudinal groove along the center line of the walk or as shown on the Contract Drawings. Tool all joints within 2 to 3 hours after the concrete is placed. After edging and tooling, remove all marks caused thereby, or otherwise, by brooming so as to give the surface a uniform texture and finish, except where exposed aggregate finish sidewalks are shown on the Contract Drawings.
- G. All exterior walks, ramps, pads and similar work shall receive broom finish. Broom finish shall be as specified in Section 03 30 00 for trowel finish with an additional final brushing after troweling.
- H. After pouring concrete, leave forms in place at least 24 hours or as directed, pour exposed concrete in accordance with Cast-In-Place Concrete section and protect from pedestrian traffic for 72 hours after pouring. Accomplish the required backfilling as soon as the forms have been removed and the concrete has properly set.
- I. Any expansion joint material extruding after the concrete is finished shall be trimmed as directed.

End of Section

**SECTION 32 17 23
PAVEMENT MARKINGS**

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This Section consists of requirements necessary when furnishing Traffic Markings as required by the project Drawings and detailed in these Specifications and MDOT Specifications.
- B. Dimensions shall be as indicated on the Drawings.
- C. Where reference is made to Mississippi Department of Transportation Specifications (MDOT), it is intended to be in accordance with **Mississippi Standard Specifications for Road and Bridge Construction, Mississippi Department of Transportation , 2004 Edition.**

PART 2 - MATERIALS

2-01

- A. All materials for Traffic Markings and related work shall comply with Mississippi Standard Specifications for Road and Bridge Construction, MDOT, 2004 Edition as follows:

2-02 PAINTED TRAFFIC MARKINGS

- A. All painted traffic markings shall conform to the requirements of the **2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction, Section 625, Painted Traffic Markings**, except as amended herein.

END OF SECTION

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**SECTION 32 31 13
CHAIN LINK FENCING**

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This item shall consist of furnishing all materials, labor, tools, equipment, and incidentals, and performing all operations necessary for the erection of chain link fencing on steel posts in accordance with the CONTRACT DRAWINGS and Specifications.

PART 2 - MATERIALS

2-1 CHAIN LINK FENCE FABRIC

- A. Shall be of steel and conform to Federal Specification RR-F-191d. The size of mesh shall be two (2) inches. The fence fabric shall be woven of No. 9 wire and shall be 72 inches high. The fence fabric shall be zinc coated, 1.2 ounces of zinc per square foot of surface area.

2-2 BARBED WIRE

- A. Shall consist of three lines of wire of No. 12 1/2 gauge wire with No. 14 gauge, 4 point barbs spaced at approximately five (5) inches on centers. The barbed wire shall be zinc coated and conform to Federal Specification RR-F-221d, Class 3, ASTM Specifications A 121, Class 3.

2-3 TENSION WIRE

- A. Shall be steel not less than No.7 gauge, zinc coated with a minimum of 0.80 ounce of zinc per square foot of surface area.

2-4 POSTS

- A. Shall be galvanized steel pipe, Schedule 40, and conform to Federal Specification RR-F-183 (1), ASTM Specification A 120. Post of different types shall be as follows:
- B. End, corner and pull posts shall be 2.875 inches O.D., 5.79 pounds per linear foot.
- C. Intermediate posts shall be 2.375 inches O.D., 3.65 pounds per linear foot.
- D. Gate posts shall be 2.875 inches O.D., 5.79 pounds per linear foot.

2-05 POST TOPS

- A. Shall be of malleable iron or pressed steel, combination type with barbed wire supporting arms or plain post caps, as specified on the drawings.

2-06 POST BRACES

- A. Shall be provided for each gate, corner, pull, and end post. Braces shall be galvanized steel pipe, 1.660 inches O.D., 1.806 pounds per linear foot. With each brace provide a truss rod 0.375 inch diameter with a turnbuckle or other provision for adjustment.
- B. Provide malleable iron or pressed steel clamps, galvanized, for fastening braces to posts.

2-07 TOP RAIL

- A. Shall be provided as specified for post braces.

2-08 STRETCHER BARS

- A. Shall be of galvanized steel not less than 3/16 inch by 3/4 inch and shall be in length one (1) inch less than the full height of the fabric.
- B. Provide one stretcher bar for each gate and end post and two stretcher bars for each pull and corner post.

2-09 ACCESSORIES

- A. Shall be of steel, malleable iron, or ductile iron, galvanized. Ties and clips may be of aluminum.

2-10 GATES

- A. The chain link fence gates shall be swing type complete with fabric, latches, stop, keepers, and hinges. Frames shall be constructed of tubular members welded at all corners or assembled with fittings. Frames shall have vertical bracing so that no vertical members are more than eight (8) feet apart.
- B. Frame construction and galvanizing shall conform to Federal Specification RR-F-183 (1), ASTM Specification A-120.
- C. For attaching barbed wire, extend each end member one foot above the top horizontal member. Attach three lines of barbed wire with band, clips, or hook bolts.

2-11 LATCH, STOP AND KEEPER

- A. Shall be provided for the gate. Forked latches shall be provided for gates. Keeper shall consist of a mechanical device for securing the free end of the gate when in full open position.

2-12 LOCK

- A. Provide heavy duty padlocks with three keys.

2-13 CONCRETE FOR POST SETTING

- A. Shall attain a compressive strength of 2,500 pounds per square inch at 28 days.

PART 3 - EXECUTION

3-1 CLEARING

- A. The site of the fence shall be cleared of obstructions and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of two (2) feet on each side of the centerline of the fence.

3-2 POST SPACING

- A. Line posts shall be spaced at intervals not to exceed 10 feet average when measured from center between terminal posts. Measurements shall be made parallel to the slope of the ground, and posts shall be placed in a vertical position.

3-3 POST SETTING

- A. End, gate, corner, pull, and brace posts shall be set 36 inches deep in concrete bases 12 inches in diameter. All line posts shall be set 18 inches deep in concrete bases eight (8) inches in diameter. The top of concrete bases shall be slightly above ground and sloped to drain. Gate posts shall be set with their tops level with one another.
- B. To establish the elevation of gate posts if the ground is not level, set the upgrade post first.
- C. Concrete bases shall be allowed to cure at least seven (7) days before installing fence fabric.

3-04 HORIZONTAL BRACING AND TRUSS RODS

- A. Provide at each terminal and corner post. Braces shall be clamped to posts at each end.

3-5 CHAIN LINK FABRIC

- A. The fabric shall be placed on the outside of the posts, stretched taut approximately two (2) inches above the ground, and fastened securely to the post. Fastening to terminal posts shall be by means of stretcher bars, with fabric bands spaced at a maximum of 15 inches on centers.

- B. Fabrics shall be fastened to line posts by means of tie wire, metal bands, or other approved method, spaced at maximum of 15 inches on centers. The top edge of the fabric shall be fastened to the top rail by means of wire ties spaced at a maximum of 18 inches on centers. The bottom edge of the fabric shall be fastened to the bottom tension wire by means of wire ties spaced at a maximum of two (2) feet on centers. Ends of abutting rolls of fabric shall be joined by weaving a single strand of wire into the ends to form a continuous mesh.

3-6 GATES

- A. Shall be erected to swing in the direction indicated. Concrete in the base on the hinged side of gate leaves shall extend up to the bottom of the lower hinge so as to provide support. Install a keeper for holding the gate.
- B. All hardware shall be thoroughly secured, properly adjusted, and left in perfect working order. Adjust hinges and diagonal bracing so that the gates hang level.

3-7 INSTALLATION

- A. Fencing shall be chain link, Type II, in accordance with the plans unless otherwise specified.

END OF SECTION
32 31 13 - 4

SECTION 32 90 00
LANDSCAPING

PART 1 - GENERAL

1-01 SCOPE

- A. This section includes furnishing, delivering, planting, and establishing trees, shrubs and ground cover of the type, species, and sizes indicated in accordance with these specifications and accompanying plans, in reasonably close conformity to the locations shown on the plans or directed.
- B. The work includes (but not limited to) furnishing all materials, labor, equipment and services necessary to perform all planting operations and related work, in accordance with the Contract Drawings, Specifications and terms of the Contract at the project

1-02 GUARANTEE

Work covered by this Section shall be guaranteed to the Owner for a period of one year from the time of final acceptance. At the end of the guarantee period (if not before), all dead plant material or plant material not in satisfactory condition shall be replaced at no cost to the Owner. (See paragraph 3-05 A and B for specific terms of replacement of plant material and conditions of guarantee.)

1-03 REQUIREMENTS

Contractor shall meet the requirements and recommendations of the applicable portions of the following standards:

- a) Standardized Plant Names: Latest Edition, American Joint Committee on Horticulture Nomenclature.
- b) American Standard for Nursery Stock: Latest Edition, American Association of Nurserymen.
- c) Mississippi Fertilizer Law: Rules and Regulations Mississippi Department of Agriculture and Commerce.
- d) All other governing Federal, State and Local Laws, Rules, Regulations and Ordinances applicable to this project and the work described herein and on Contract Drawings.
- e) Shall be performed by a licensed Landscape Contractor.

1-04 FIELD INVESTIGATIONS

Each Bidder/Contractor shall visit the job site and familiarize himself with the nature and location of the work, existing conditions and conditions that will exist under which he will be obligated to operate in the performance of the work.

PART 2 - PRODUCTS

2-01 DELIVERY

Material damaged in transit or in storage will not be accepted. Plants and materials delivered to the site prior to actual usage shall be stored in a place so as not to interfere with other trades or construction operations and shall be protected from damage by weather or other elements as needed for the specific material.

2-02 STORAGE

Plants delivered to site before time of immediate planting shall be stockpiled and kept in a healthy condition. All B & B material shall be heeled in for protection against sun and dry winds. Provide watering as needed. Protect plants from contamination from the elements. Packaged materials shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis.

2-03 MATERIALS - GENERAL

- A. HANDLING: Plant materials shall be carefully handled to prevent drying out or damage to stems, trunk, or root ball. Handle plants only by balls, trunks or containers. All materials, including plants, shall be handled so as not to accidentally open containers before time of actual mixing or usage, and shall be handled so as to avoid contamination.
- B. QUALITY: All materials are subject to approval by the Engineer's Staff Landscape Architect and are subject to rejection if in the Engineer's Staff Landscape Architect's opinion any and/or all materials do not meet the requirements of the Specifications or drawings.

2-04 PLANTS

- A. PLANT LIST: Botanical and common names of the Project plants are given on the Plant Materials List included on the Contract Drawings. The Plant Materials List also provides size and quality requirements. Contractors shall bid on and provide the plants quoted on the drawings in their locations as quantities on the PLANT LIST may not be exact.
- B. QUALITY: Plants shall be nursery grown (unless specified otherwise), freshly dug, well formed, vigorous growing specimens with growth typical of the varieties specified and shall be free from injurious insects and diseases. Plants shall have sufficient fibrous feeding roots to permit satisfactory growth after planting. All plants furnished shall have been grown under climatic conditions similar to those in the locality of the project.
- C. SUBSTITUTIONS: Substitutions for plant species or size shall be made only with the written approval of the Engineer's Staff Landscape Architect.
- D. BALLED AND BURLAPPED (B&B) PLANTS: Plants to be balled and burlapped shall be dug so as to retain as many fibrous roots as possible, and shall come from soil which will form a firm ball. The soil in the ball shall be the original and undisturbed soil in which the plant has been grown. The

plant shall be dug, wrapped, transported, and handled so that the soil in the ball will not be loosened sufficiently to cause stripping of the small and fine feeder roots or to cause the soil to drop away from contact with the roots. Earth balls shall be trim, well shaped, with sufficient earth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be wrapped with burlap. Plants grown in containers will be accepted as "B & B" providing that the plants have been growing in the containers for at least one full growing season prior to delivery to the job site and that containers are adequate for the developing root system of that plant.

- E. CONTAINER GROWN (CG) PLANTS: Container grown plants shall be well-rooted and established in the containers in which they are sold. An established container grown plant shall be a plant transplanted into a container and grown in that container sufficiently long for new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container. The container shall be sufficiently rigid to hold the ball shape protecting the root mass during shipping and handling.
- F. INSPECTION: All plant materials are subject to inspection at any time during the life of the Contract by an authorized representative of the Engineer's Staff Landscape Architect. Inspections before or during planting operations, however, shall not be construed as final acceptance of the plants involved.
- G. SIZE REQUIREMENTS: As per American Standard for Nursery Stock for Caliper, Height, Spread, Container, etc., in the sizes noted on the Plant Materials List. Sizes specified are minimum. Should the specified size not be available, Contractor shall utilize the next larger standard industry size.
- H. COLLECTED STOCK: Whenever "collected" stock is specified in connection with a species or variety, the stock shall not be nursery grown, but shall have been grown under natural conditions at the location from which it is acquired. When approved, collected stock may be obtained from areas no longer under cultivation as nursery stock.

2-05 SOIL AND ADDITIVES

- A. PLANTING SOIL: (for tree, shrub and ground cover planting) Planting soil shall be two parts topsoil and one part pine bark and one part peat moss soil conditioner by volume. Add two (2) pounds of specified commercial fertilizer per cubic yard unless directed otherwise by Engineer's Staff Landscape Architect. Any Yazoo clay shall be removed from planting beds to a depth of 1.5' below finish grade and replaced with planting soil.
- B. TOPSOIL: Rich, friable, sandy loam soil which is free of lumps, debris, and as much as possible, free of weeds, toxic substance, material or substances that may be harmful to plant growth or any other undesirable matter. The ph range shall be 5.5 to 6.5.
- C. PINE BARK SOIL CONDITIONER: Commercially manufactured pine bark, with no chunks larger than three inches (3") across the surface, shall be utilized for incorporation into all planting soil and soil for bedded areas.
- D. PEAT MOSS SOIL CONDITIONER: Peat moss shall consist of partially decomposed vegetative matter of natural occurrence. It shall be brown, clean, low in content of mineral and woody material, mildly acid, and granulated or shredded.

2-06 WATER

The owner shall allow the Contractor to use water from existing facilities for the purpose of project construction. The Contractor shall take steps to assure that the water supply or water used for construction purposes does not become contaminated.

2-07 FERTILIZERS/ROOT STIMULATORS/HERBICIDE

A. COMMERCIAL FERTILIZERS: Shall be complete formula manufactured standard products complying with regulations and laws at the time of bidding. Fertilizers shall be uniform in composition, dry and free flowing, and shall contain not less than the percentage by weight of ingredients set out in the following table:

<u>GRADE</u>	<u>NITROGEN</u>	<u>PHOSPHORUS P-2-0-5</u>	<u>POTASH K-2</u>
5-10-5	5	10	5

An allowance of four percent (4%) variation or tolerance of the above proportions will be permitted based on relative commercial value.

1. Application rates:

- a) Apply at the rate of 5 pounds per 1,000 square feet in all areas designated for bed preparation.
- b) This is in addition to the fertilizer required in Planting Soil Preparation, paragraph 2-05A.
- c) When pole peelings are utilized for mulch, Contractor shall add fertilizer as necessary to offset nitrogen deficiencies.

B. SULFUR: Add one pound of approved agricultural grade sulfur per cubic yard of planting soil in all beds containing azaleas, camellia, indian hawthornes and gardenias.

C. PRE-EMERGE HERBICIDE: Incorporate approved pre-emerge herbicide into planting soil for trees and planting beds prior to installation for plant material. Deliver in manufacturer's containers and apply according to manufacturer's instructions. SUBMITTAL REQUIRED.

D. ROOT STIMULATOR: Contractor shall apply an approved root stimulator to all plant material at the time of installation. Apply in accordance with manufacturer's recommendations. SUBMITTAL REQUIRED.

2-08 MULCH

Mulch for use in tree, shrub, and ground cover planting operations shall be clean, fresh, insect free pine straw (unless noted otherwise on the plans) and shall be free from weeds, disease organisms, spores, or other foreign material or any substance inhibitory to plant growth.

2-09 STAKING

A. STAKES: Metal Studded T-Posts (fence posts) color - green, minimum 6' long.

B. WIRE: Annealed galvanized steel wire, 12 gauge.

- C. TREE WRAP: Two thicknesses of crinkled paper cemented together with a layer of bituminous material and a minimum of 4" in width. Tree wrap shall be secured with a lightly tarred medium or coarse yarn normally used for that purpose and approved by the Engineer's Staff Landscape Architect. Yarn shall not contain any nylon material. Wrap shall be required for all trees except those with low branching and multi-trunk trees less than six feet in height.
- D. ANTIDESICCANT: Plants budding into leaf shall be sprayed with an antidesiccant prior to installation. The antidesiccant shall be an emulsion that will provide film over plant surfaces permeable enough to permit transpiration, and will not damage the plant.

PART 3 - EXECUTION

3-01 ENVIRONMENTAL CONDITIONS

Conduct planting operations in weather conditions which provide favorable temperature, moisture and soil conditions for plant growth. When soil and weather conditions are adverse to proper planting, the planting operations shall be suspended. Planting operations shall take place during seasons which are normal for such work, unless directed otherwise by the Engineer's Staff Landscape Architect.

3-02 PLANTING OPERATIONS

- A. The Contractor shall not start or resume work if there is a danger of his work being damaged or destroyed by the work of other trades on the job in the normal pursuit of their trade. The Landscape Contractor shall coordinate with the General Contractor and/or other trade Contractors on the job site.
- B. The Contractor shall check for locations of both overhead and underground utilities/lines that might interfere with his portion of the work. Report potential interferences to the Engineer's Staff Landscape Architect prior to planting.
- C. The Contractor shall mix planting soil before plants are delivered and placed. Planting soil may be in bulk loads and stockpiled on site if covered and protected from contamination and moisture. Soil additives and fertilizers shall be added at time of mixing.
- D. Plant material shall be placed as indicated on the drawings. The Contractor shall notify the Engineer's Staff Landscape Architect of any errors, omissions, discrepancy, or conditions, on the site at or before time of planting which are not shown on Drawings or in Specifications, and which make placing adjustments necessary. Upon notification, the Engineer's Staff Landscape Architect will furnish the Contractor with adjustments or corrected positions. Plant materials shall be located as indicated on the drawings and their locations approved on site by the Engineer's Staff Landscape Architect's Landscape Architect prior to installation.
- E. If an approved topsoil is available on the site, then such topsoil may be used. However, under all circumstances, specified soil conditioners and other additives shall be added to the topsoil to prepare a suitable planting soil that creates a positive growing environment. Excavate and remove excess soil, as necessary to insure proper drainage and finish elevations.

3-03 CARE AND HANDLING OF PLANTS

- A. Unless otherwise allowed by the Engineer's Staff Landscape Architect, all plants with bare roots that are not planted within four hours after delivery to the project shall be "heeled-in" in a moist soil.
- B. The roots of "B&B" plants and container grown plants that are not planted within four hours upon delivery shall be adequately protected by a covering of soil, sand, sawdust, etc. and kept moist.
- C. All heeled-in plants shall be properly maintained by the Contractor until planted. When plants are delivered in boxes, wrapped bundles, or other forms of closed packages, the packages shall be opened immediately after delivery and the plants inspected and dampened if necessary. While plants with bare roots are being transported to and from heeling-in beds, or being distributed for planting, the roots shall be protected from drying out by means of wet canvas, burlap, straw or by other approved methods.
- D. Balled and burlapped plants shall be handled by the ball and placed in the hole in such a manner that the soil will not be loosened from the roots.

3-03 PLANTING OPERATIONS - INSTALLATION

- A. Stake out on the ground, locations for plants as per dimensions and scale on Drawings, with lines and spacing conforming to the layout shown on the Drawings.
- B. BED PREPARATION: In all areas to receive bed preparation:
 - 1. For all bed areas, strip the proposed bed area of any existing grass or plant material unless designated to remain.
 - 2. For all bed areas that do not require the removal of undesirable topsoil or subsoils:
 - a. Spread a three inch (3") layer of pine bark/peat moss soil conditioner throughout the area, and have it approved by the Engineer's Staff Landscape Architect.
 - b. Till in the pine bark/peat moss soil conditioner to a depth of 6" uniformly throughout the area.
 - 3. For bed areas requiring the removal of undesirable topsoil or subsoil, remove undesirable soils to a depth of 1.5 and replace with planting soil.
 - 4. For all bed areas excavate planting pits in accordance with paragraph 3-03D.
- C. SPECIAL NOTES - BED PREPARATION: Planting seasons and conditions: Planting shall be done when the ground is not frozen, snow covered, or in an otherwise unsuitable condition for planting.
 - 1. In areas next to buildings, or in cases where additional topsoil is required or inappropriate soil must be replaced the Contractor shall excavate 1.5' of existing soil and remove completely from site in order that finish grade of bed adjacent to building (not including mulch) is not less than .2' below finish floor elevation.

2. Beds adjacent to buildings shall have a cross slope of not less than 2% from the building wall to the outside of the bed.
 3. Protection of existing vegetation: If lawns have been established prior to planting operation, the surrounding turf shall be covered before excavations are made in a manner that will protect turf areas. Existing trees, shrubbery and beds that are to be preserved shall be barricaded in a manner that will effectively protect them during planting operations.
- D. EXCAVATION: Excavate planting pits with vertical sides and remove excavated material. Pits shall be circular in outline and shall have a profile which conforms to the "Tree Planting Detail" and "Shrub Planting Detail" diagrams included on the Drawings for the specific type and size. Scarify bottom and sides of pit prior to placement of planting soil to establish a blend of existing soil and planting soil. Excavations shall conform to the following specifications:
1. Trees - 12" greater in diameter than ball for trees 3" caliper and under.
 - 18" greater in diameter than ball for trees over 3" caliper unless specified otherwise.
 - All pits shall be 6" greater in depth than the burlapped ball or container, but shall be a minimum depth of 18".
 2. Shrubs - Shrub pits shall be 1 1/2 time the width of the diameter of the ball or container and 6" deeper.

The minimum depth shall be 15".
 3. Ground Cover - Excavate planting pits for ground cover to minimum depth of 9" in all cases.
- E. DETRIMENTAL CONDITONS: Notify the Engineer's Staff Landscape Architect immediately of subsurface drainage or soil conditions which the Contractor sees as detrimental to growth or survival of plant material. Obtain approval of method of correction before proceeding.
- F. SETTING PLANTS:
1. Set plants on compacted planting soil to such depths that the finished grade level of the plant after settlement shall be same as that at which the plant was grown. Water as described in paragraph "G".
 2. Fill and compact remainder of pit with a 50% - 50% mix of excavated material and planting soil. (Where excavated material is acceptable to Engineer's Staff Landscape Architect, otherwise use 100% planting soils as described in 2-05,A.) Water as described in paragraph "G".
 3. Plant upright and faced to give the best appearance or relationship to adjacent roadway and structures.
 4. Burlap shall not be pulled out from under the ball of balled and burlaped plants. However, cut bindings and pull back the top 1/3 of the burlap to the top edge of the ball. If burlap is not a degradable type, totally remove. Platforms, wire and surplus binding from top and sides of ball shall be cut off cleanly. Containers other than burlap shall be removed from plant.

5. Soil shall be placed, compacted and watered thoroughly.

6. Stake trees as noted on the drawings.

G. WATERING:

1. Following compacting of planting soil and prior to setting of plants, add water to excavation for settlement.

2. After water has soaked in, set plant and backfill to 2/3 full with the mix of excavated (where excavated material is acceptable to Engineer's Staff Landscape Architect, otherwise use 100% planting soil as described in 2-05, A.), and water thoroughly. Fill in remainder of soil and water again.

3. Form a 4" mound of soil around the outside edge of the pit or bed area to form a shallow watering basin.

4. Add approved root stimulator at time of watering.

H. PRUNING: Prior to Release of Maintenance, remove dead and broken branches from all new plant material and plant material which has been relocated or damaged during the work. Prune to retain typical growth habit of individual plants with as much height and spread as is practicable unless specified otherwise by the Engineer's Staff Landscape Architect. Make all cuts with sharp instrument flush with trunk or adjacent branch in such manner as to insure elimination of stubs. Paint all cuts 1/2" in diameter and larger with waterproof antiseptic tree paint.

I. MULCHING: All plant material shall be mulched immediately after planting to a depth of 6" with clean fresh pine straw. Mulching around pit planted plants shall extend to the outside of the watering basin to form a circular shape of consistent size for like size and type plants.

J. WRAPPING: The trunks of smooth-barked trees shall be wrapped with an approved material prepared especially for tree wrapping.

Wrapping shall begin two inches below the ground line and continue upward to the lower-most branches, and shall be firmly placed and securely fastened in a manner that will not injure the trunk of the tree.

3-04 PROJECT COMPLETION - PLANT MATERIALS

A. CLEAN-UP: Refer to GENERAL CONDITIONS

B. MAINTENANCE BY CONTRACTOR:

1. The Contractor shall use good horticultural practices to keep all plants installed in a healthy condition until final inspections for Release of Maintenance. This shall begin immediately after each plant is planted and shall continue until all planting has passed final inspection for Release of Maintenance.

2. Shall include watering, weeding, cultivating, mulching, fertilizing (when needed), removal of dead materials, resetting plants to proper grades or upright position and restoration of the planting saucer and other necessary operations.

3. Proper protection to lawn areas shall be provided and any damage resulting from planting operations shall be repaired promptly.
4. The area around planted trees and shrubs shall be maintained reasonably free of weeds and grass within a minimum radius of two feet from each plant trunk or the entire plant pit or bed. Where practicable to effectively accomplish this work without removal of the mulch, removal will not be required. If it is necessary to remove the mulch to effectively accomplish this work, removal and replacement shall be performed at no additional cost to the Owner.

C. MAINTENANCE BY OWNER:

1. Shall not begin until Final Acceptance.
2. The Owner will provide adequate maintenance during the guarantee period, however, it shall be the Contractor's responsibility to fully explain the watering, pruning or other maintenance needs of the work to the Owner.
3. The Contractor shall be responsible for all planting until the guarantee period is up, unless the Owner is grossly negligent in his maintenance of the work.

3-05 GUARANTEE, INSPECTION, AND ACCEPTANCE

A. INSPECTION: To determine completion of Contract, exclusive of the possible replacement of plants, an inspection will be made by the Engineer's Staff Landscape Architect at the conclusion of all planting. It shall be the responsibility of the Contractor to request final inspection by the Engineer's Staff Landscape Architect.

B. PLANT ESTABLISHMENT PERIOD: The Contractor is responsible to replace mis-shapen, dead, dying, stunted, or unhealthy plant material for a period of one year, BEGINNING at the Final Acceptance of the completed project. Plant material shall be alive and in a satisfactory condition and growth for each specified species of plant at the end of the plant establishment period, unless the plant material has suffered from direct damage or negligence by the Owner. Replacements shall be at no cost to the Owner. If any of the plant material is damaged directly or indirectly as a result of the work prior to final acceptance of the complete project, including work other than landscaping, said material shall be replaced by the Contractor at no cost to the Owner.

C. REPORTS BY LANDSCAPE CONTRACTOR:

1. Following the Final Inspection, the Landscape Contractor shall make periodic inspections of the work to verify minimal maintenance by Owner. The Owner's minimal maintenances shall include proper watering and avoiding plant damage during the Owner's maintenance operations. These inspections shall be made at least once every thirty (30) calendar day period.
2. The Landscape Contractor shall file written reports with the Owner and the Engineer's Staff Landscape Architect. Failure to do so shall relieve the Owner of his minimal maintenance requirements during the plant material guarantee period.

D. REPLACEMENT:

1. During or at the end of the guarantee period, any plant required under this Contract which is dead or not in satisfactory condition as determined by the Engineer's Staff Landscape Architect, shall be removed and replaced. Not in satisfactory condition shall include stunted, unhealthy mis-shapen, dead and dying.
2. The Contractor SHALL NOTIFY the Engineer's Staff Landscape Architect when he plans to replace the plant(s) so that the Engineer's Staff Landscape Architect and/or the Owner may be present at the time of replacement.
3. Plants replaced shall be guaranteed for a period of one year with the guarantee period beginning at the date of final acceptance. Replacement plants shall be of the same variety and species as provided on the original plant list, herein and on Drawings, unless directed otherwise by the Engineer's Staff Landscape Architect. Replacement shall be at the expense of the Contractor. Replacement can be delayed until environmental conditions are most conducive to plant establishment upon agreement between the Owner, Engineer's Staff Landscape Architect, and Contractor.

PART 4 - COMPENSATION

4-01 MEASUREMENT

- A. Undamaged and healthy trees, shrubs, and ground cover in place at the time of final inspection will be measured per each for each species, size and type specified.

Furnishing, installation, staking or guying, weed and grass control, pruning, removal of dead and defective trees and shrubs or missing trees and shrubs will not be measured for separate payment.

Topsoil used for backfilling plantings will not be measured and paid for separate payment.

Fertilizer ordered and acceptably used will not be measured for separate payment.

Mulch ordered and placed in accordance with the requirements of these specifications will not be measured for separate payment.

Water ordered and acceptably used will not be measured for separate payment.

Construction of water rings, haul and disposal of surplus or unsuitable excavation, and other plant establishment work required in the Contract shall be considered incidental to tree or shrub planting and will not be measured for separate payment.

Measurement for payment will be made in the following sequence:

When all plants have been planted in accordance with the Contract, 90 percent of the Contract Lump Sum will be allowed.

Upon Final Inspection, 100 percent of the unit price will be allowed for surviving trees and shrubs meeting the requirements of the Contract.

4-02 PAYMENT:

A. Accepted quantities of each species, size and type of trees and shrubs will be paid for at the Contract unit price per each. Prices thus paid shall be full compensation for completing the work.

END OF SECTION

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SECTION 32 92 19
SODDING, SEEDING, FERTILIZER AND MULCH

PART 1 - GENERAL

1-01 DESCRIPTION

- A. General: This item consists of preparing the ground surface, furnishing and applying fertilizer and lime, furnishing and sowing grass seeds, furnishing and placing grass sod on prepared areas, finishing, compacting, watering, establishing and repairing same in accordance with these Specifications at the locations shown on the plans or as directed by the Contracting Officer.
- B. Seeding: This work shall consist of furnishing the specified kind and variety of seeds and seed treatment materials, treating and planting the seeds in a prepared and approved seedbed; covering the seeds and compacting the seedbed; and providing plant establishment, in accordance with these Specifications and in the locations shown on the Drawings or as established by the Contracting Officer.
- C. Fertilizing: This work shall consist of furnishing, transporting, spreading, and incorporating fertilizers of the type and in the amount designated into the prepared ground in the locations shown on the plans.
- D. Sodding: This work shall consist of supplying, transporting and placing live, viable sod of the types required in the locations specified on the plans.
- E. Mulching: This work shall consist of furnishing, transporting and placing asphalt coated or mechanically stabilized vegetative mulch on seeded areas of slopes, shoulders, medians and other areas indicated on the plans, or as designated by the Contracting Officer.
- F. Lime: This work shall consist of furnishing, transporting, and placing lime on slopes, shoulders, ROW, and other areas as directed by the Contracting Officer.

PART 2 - MATERIALS

2-01 SEED

- A. Seeds with a minimum pure live seed content of 90 percent shall be used. They shall be of the best grade and of known vitality, purity and germination and shall be delivered in containers bearing seed tags as required by law showing percentages of germination content and purity of seed as well as percentages of weed seed content. All seeds shall be free of wild onion, Canadian thistle, Johnson grass, crab grass or other seeds of noxious weeds. Seed which has become wet, moldy or otherwise damaged in transit or storage will not be acceptable.

B. Purity, Germination and Planting Schedule

<u>Name</u>	<u>Percent Purity</u>	<u>Percent Germination</u>	<u>Mix (Dry Wt. Lbs. Per Acre)</u>
Spring and Summer Seeding (March 1 to September 1)			
Hulled Bermuda	95	90	<u>20</u>
Total			20
Fall and Winter Seeding (September 1 to March 1)			
Unhulled Bermuda	95	90	20
Rye	95	85	<u>15</u>
Total			35

2-02 FERTILIZER

- A. Fertilizer shall be an approved commercial grade containing nitrogen, phosphorus and potash and shall be delivered accompanied by identification of the brand and grade being furnished. Fertilizer may be furnished in bulk, in bags or other approved containers.
- B. Unless otherwise specified, fertilizer shall be dry granular grade 13-13-13 (triple thirteen) containing equal parts of nitrogen, phosphorus and potash, respectively.

2-03 SOD

- A. Sod shall be produced by a commercial sod farm located as close to the contract work as possible. Sod shall be a live, fresh, growing grass mat at least two (2) inches in thickness with soil adhering firmly to the roots. The sod shall be reasonably free from weeds and other grasses. Sod may be delivered in standard blocks neatly stacked on pallets or in rolls.
- B. Sod, unless otherwise required, shall be of the variety growing in the location to be sodded. Where little or no identifiable native grass can be found, sod shall be common bermuda.

2-04 MULCH

- A. Mulch shall be Class I vegetative material consisting of approved baled straw from cereal grain or common native hay crops in accordance with Section 215 and 715 of the MDOT Standard Specifications. The mulch shall have been cured properly prior to baling and shall be reasonably free of foreign grasses and weeds. All straw material shall be approved by the Contracting Officer prior to use.
- B. Where specified on the plans or called for in the Proposal, mulch shall be bituminous coated with Grade SS-1 emulsified asphalt in accordance with Section 702 of the MSHD Standard Specifications.

2-05 LIME

- A. Lime shall be dry, native, crushed agricultural rock limestone reasonably free from rock, gravel, dirt, clay, roots and other objectionable material. Lime may be furnished in bulk, in bags or other approved containers.

2-06 EQUIPMENT

- A. The Contractor shall provide tractors, trucks, discs, harrows, drags, drills, sprayers, blowers and other incidental equipment as needed to properly place and install the seed, sod, fertilizer, water, lime, compact, grade, mulch and establish a living turf in the areas shown on the Drawings in accordance with these Specifications.

2-07 WATER

- A. Fresh, clean potable water shall be provided and used by the Contractor.

PART 3 - EXECUTION

3-01 GENERAL

- A. Ground Preparation, Fertilizing and Liming:

1. The area to be planted shall be disced and prepared to a depth of at least four (4) inches. The specified amount of fertilizer and lime shall be applied uniformly over the surface and harrowed lightly so that it will be incorporated into the upper two (2) inches of the soil. If the soil is not moist, it shall be watered until it is in workable condition.
2. The completed area to be planted shall present a smooth, uniform surface true to line and cross section. Planting shall follow immediately.

- B. Protection: The Contractor shall be responsible for maintaining and protecting seeded, sodded, mulched areas until final acceptance of the project. He shall take every precaution to prevent unnecessary foot and vehicular traffic and shall repair and restore damaged areas immediately, without extra compensation.

- C. Maintenance:

1. The Contractor shall maintain the grassed areas until final acceptance of the work. Maintenance shall consist of refertilizing, watering, preserving, protecting, replacing, and such work as may be necessary to keep the seeded or sodded areas growing in a satisfactory condition.
2. The Contractor shall be responsible for satisfactory growth of the grass, and until final acceptance he will be required to water and mow the grass at such intervals as will insure a living and growing sod at the time of acceptance. A "living and growing sod" shall be interpreted to include sod that is seasonably dormant during the cold or dry season with roots that have taken hold in the topsoil and capable of growing off after the dormant period.

3-02 SEEDING

- A. General: Seeding shall be accomplished with approved seed as specified in 2-01.B. herein.

- B. No seeding shall be done during windy weather or when the ground is frozen, wet or otherwise in a nontillable condition. Full advantage shall be taken of time and weather conditions best suited for seeding, and such time of seeding shall be subject to the approval of the Contracting Officer.
- C. The seeds shall be sown uniformly in the specified amounts, preferably by approved mechanical seeders, and immediately rolled with a cultipacker or other satisfactory equipment; or covered lightly with soil by the use of garden rakes, or other approved methods.

3-03 FERTILIZING

- A. Fertilizer shall be spread uniformly at the rate specified preferably by mechanical methods. Lumps shall be broken as specified by the Contracting Officer, where found objectionable.
- B. Application: 500 lbs/acre unless otherwise specified.

3-04 SODDING

- A. General: Solid sod shall only be placed when weather and soil conditions are deemed, by the Contracting Officer, to, be suitable for proper placement and growth.
- B. The solid sod shall be placed on the prepared surface with the edges in close contact. Cracks between blocks or strips of solid sod shall be closed with small pieces of fresh sod and cracks too small for sod shall be filled by a light dressing of topsoil. The entire sodded area shall then be compacted and watered to the satisfaction of the Contracting Officer. Rollers, hand tamps or other approved equipment may be used for compacting.
- C. Surfaces of solid sodding which, in the opinion of the Contracting Officer, may slide due to the height and slope of the surface or nature of the soil, shall, upon direction of the Contracting Officer, be "pegged" with wooden pegs driven through the sod blocks into firm earth, sufficiently close to hold the sod in place.

3-05 MULCHING

- A. Equipment: When anchoring mulch with bituminous material, the approved equipment shall be capable of maintaining a constant air stream which will blow or eject controlled quantities of asphalt coated mulch in a uniform pattern. A jet or spray nozzle for applying uniform, controlled amounts of asphalt to the vegetative material as it is ejected shall be located at or near the discharge spout. The amount of asphalt applied shall be sufficient to provide a spotty tack at the time of mulch placement. The discharge shall be kept at a relatively high angle to permit the coated mulch to fall properly in place.
- B. Mulching shall be placed uniformly on designated areas within twenty four (24) hours following the planting of spot sod, sod, or seeds, as applicable, unless weather conditions are such that mulching cannot be performed. Placement shall begin on the windward side of areas and from top of slopes. In its final position the mulch shall be loose enough to allow air to circulate but compact enough to partially shade the ground and reduce erosion. Mulch shall be bituminous coated where specified on the plans. The baled material shall be loosened and broken thoroughly before it is fed into the machine to avoid placement of unbroken clumps.

- C. Application Rate: Two (2) tons of mulch per acre. If bituminous material is used, the rate of application shall be 150 gallons emulsified asphalt per acre.

3-06 LIMING

- A. General: Agricultural lime shall be spread uniformly at the rate specified, preferably by mechanical methods. Lumps shall be broken as specified by the Contracting Officer where found objectionable.
- B. Application Rate: Two (2) tons per acre unless otherwise specified.

End of Section

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SECTION 33 30 00

SANITARY SEWERAGE – GRAVITY PIPING

PART 1 - GENERAL

1-01 DESCRIPTION

- A. In accordance with the requirements of these Specifications, the Contractor shall furnish and install materials and perform work necessary for or incidental to constructing sanitary sewer gravity piping complete and ready for use.
- B. The work shall include excavation, trenching and backfilling; furnishing and installing trench sheeting, shoring and bracing; furnishing and installing pipe, specials, services, manholes and related appurtenances; storage and protection of materials; testing, cleanup and other operations necessary to complete the work in accordance with the Specifications and Drawings.
- C. Sanitary sewer installed by pipe bursting is specified elsewhere.

1-02 CONTRACTOR'S EQUIPMENT

- A. The Contractor shall provide and maintain the equipment necessary to prosecute the work in an orderly and safe manner. The equipment shall consist of suitable units designed or selected to perform and expedite the work and incidental items of construction.

1-03 CONFLICTS WITH OTHER UTILITIES

- A. Where the location of the sewer is not clearly defined by dimensions on the Drawings or unless otherwise directed by the Engineer, the sewer shall not be laid closer horizontally than ten feet (10') to a water supply main except that where the bottom of the water pipe will be at least eighteen inches (18") above the top of the sewer pipe, horizontal spacing may be a minimum of six feet (6'). **Water and sewer pipe shall NOT be laid in the same trench.** Where gravity flow sewers cross above water lines, the sewer pipe, for a distance of ten feet (10') each side of the crossing shall be fully encased in concrete.
- B. Where sewer construction conflicts with underground utilities which are indicated to remain in place, the Contractor shall be fully responsible for protecting these facilities and for restoring the portions of those lines which are damaged or severed as a result of his operations. Where existing lines in conflict are indicated to be removed by others, the Contractor shall cooperate with the Owner of these utilities to the end that these conflicts may be removed prior to excavation for the sewers.

1-04 APPLICABLE DOCUMENTS

- A. All referenced publications form a part of this Specification and, where referred to by basic designation only, are applicable to the extent indicated. Reference is to the latest edition of each unless specified otherwise.
- B. Local Building Codes: City, County, States or Federal Codes applying to the work.
- C. Miss. Standard Specifications for Road and Bridge Construction, latest edition: Sections as referenced herein.

- 1-05 SUBMITTALS: The Contractor shall submit testing reports, manufacturer's certifications, shop drawings, manufacturer's catalogs, specification sheets and other incidentals, to the Engineer, prior to ordering material.

PART 2 - PRODUCTS

2-01 GENERAL

- A. The Contractor shall furnish materials necessary for or incidental to constructing a gravity sanitary sewer system. Materials shall be new and of first quality with certified tests for pipe and pipe fittings made at the manufacturers plant to assure conformance with these technical provisions. Three (3) certified copies of each test result shall be furnished to the Engineer prior to installation.
- B. The kinds and classes of materials incorporated into the work shall be designated by the Engineer. The Contractor shall not construe or interpret the several kinds of materials described herein as being equal in their application for the project.

2-02 WATER FOR CONSTRUCTION AND TESTING

- A. The Contractor shall be responsible at his expense for water needed in constructing the work, flushing the completed system, testing and other incidental needs. Water used shall be from an approved source relatively free of pollution and shall be of a satisfactory bacteriological quality. Contractor shall remove all water from pipelines upon completion of testing at his expense.
- B. Water used in mixing concrete and mortar shall be fresh, clean and potable, suitable for drinking.

2-03 PIPE AND FITTINGS

A. PVC Large Diameter Heavy Wall Closed Profile Pipe

- 1. General: The work in this section includes furnishing all labor, equipment, and materials required to supply, install, and test (PVC) closed profile wall pipe, including accessories, as shown on the drawings and/or specified herein. All pipes shall be furnished by a manufacturer with a minimum of five years experience producing closed profile PVC pipe. The pipe manufacturer will also be required to provide a list of not less than 10 successfully completed projects.

- 2. Quality Assurance:

- a. The contractor shall submit to the Engineer written evidence that the pipe furnished under this specification is in conformance with the material and mechanical requirements specified herein. All pipes to be installed under this contract shall be inspected at the plant and certified by an independent agency, pre-approved and chosen by the design engineer for compliance with this section.

Each PVC closed profile wall pipe length and fitting shall be clearly marked with the following:

- 1) Manufacturer's Name
- 2) Nominal Pipe Size
- 3) Cell Classification
- 4) ASTM F 1803 Designation
- 5) Uni-Bell Plastic Pipe Association Designation ("UNI-B-9")
- 6) **Pipe Stiffness - 60 PSI per ASTM D-2412**

- b. All pipe shall be factory air tested with gasket in place and marked accordingly.

- 3. Handling/Storage

- a. The pipe shall be handled carefully with nylon slings. The pipe can be unloaded/transported with construction equipment rigged with an “extra long fork” attachment.
- b. All pipe and accessories shall be stored on flat, level ground with no rocks or other objects under the pipe.
- c. The maximum stacking height for PVC closed profile wall pipe shall be as directed by the manufacturer.

<u>Pipe Size</u>	<u>Number of Rows</u>
21”	6
24”	5
27”	5
30”	4

4. PVC Pipe Materials

- a. General
 - 1) Apart from structural voids and hollows associated with profile wall designs, the pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions and other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.
 - 2) Unless otherwise shown on the drawings or directed by the Engineer or manufacturer, the maximum depth of cover, measured from the pipe crown to the ground surface, permitted for all 21” to 54” sizes will be 30 ft. with standard bedding. The allowable depths are based on the assumption that the ground water level or phreatic surface is at surface grade elevation.
- b. PVC Large Diameter Heavy Wall Closed Profile Pipe
 - 1) PVC profile wall pipe and fittings shall be manufactured in accordance with the requirements of ASTM F 1803 latest edition.
 - 2) PVC profile wall pipe shall be made from a compound meeting the requirements of cell classification 12364A as defined by ASTM D 1784.
- c. Joints
 - 1) PVC profile wall pipe joints shall be the bell and spigot type, and shall conform to ASTM D-3212.
 - 2) Gaskets shall meet the requirements of ASTM F 477 and be molded into a circular form or extruded to the proper section, then spliced into circular form, and shall be made of a properly cured high grade elastomeric compound.
 - 3) Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Field installed gaskets and field cut beveled lengths of pipe shall be done in accordance with the manufacturer’s instructions and recommended equipment and materials.
 - 4) All pipe gaskets and spigots will be thoroughly cleaned and lubricated before assembly.
 - 5) The use of putty, filler, rubber or plastic inserts to form either the inner or outer wall of the pipe will not be allowed on spigots or bells.
 - 6) Gaskets shall be of a four finned design and shall have a minimum sealing width of 3.25 inches.

5. Service Connections

- a. Lateral connections to PVC profile wall pipe may be made using Inserta- tee as manufactured by the Fowler Manufacturing Company, of the Predco Fast Fit tap system or approved equal.
- b. All saddle or tapping tees will be installed per manufacturer’s recommendation. If exposed, channels in the PVC profile will be filled with 3M industrial sealant No. 602.
- c. All straps, housings, fasteners, and other hardware for any lateral connections, including transition from building or the source piping stub-out, shall be constructed of stainless steel.

6. Customer Inspection: The Engineer shall be entitled to inspect pipes and witness the manufacturing process.

C. **Solid Wall PVC sewer pipe and fittings:** Shall be solid wall in accordance with ASTM D-3034, SDR 26 minimum for sizes 4" through 18". Joints shall conform to ASTM D-3212 and be elastomeric gasket conforming to ASTM F-477. Depth of bury for PVC pipe shall not exceed limits acceptable to the Engineer. Jointing shall be completed in accordance with manufacturer's specifications.

PVC pipe shall be designed to provide a minimum pipe stiffness value of 115 psi for SDR 26 for all sizes when tested in accordance with ASTM Standard Specification D-2412 at a deflection of five percent (5%).

Solid Wall PVC pipe shall be limited to the maximum trench depths shown in the following table.

MAXIMUM TRENCH DEPTHS FOR SOLID WALL PVC PIPE

PIPE TYPE	PIPE DIAMETER	MAXIMUM DEPTH TO INVERT OF PIPE	
		BEDDING DESIGNATION CLASS "1"	CLASS "2"
SDR 26	6"	20'	20'-30'
SDR 26	8"	20'	20'-30'
SDR 26	10"	20'	20'-30'
SDR 26	12"	20'	20'-30'
SDR 26	15"	20'	20'-30'
SDR 26	18"	20'	20'-30'

2-04 MARKING SEWER PIPE

A. Each pipe or fitting shall have plainly and permanently marked on the outside the following: (1) pipe class or D-Load; (2) date of manufacture; and (3) manufacturer's name or trademark. Marking shall be neatly stamped in the pipe or painted thereon with waterproof paint.

2-05 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be responsible for the condition of excavations made by him. Slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances that may occur. **The Contractor is solely responsible for maintaining safe working**

conditions in accordance with OSHA regulations.

- B. Installation of sheeting, shoring and bracing shall be the responsibility of the Contractor. Shoring left in place shall not entitle the Contractor to claims for extra compensation unless so indicated on the Bid Form as a separate pay item.

2-06 INCIDENTAL MATERIALS

- A. Gray Iron Castings: Shall conform to the standard specifications for gray iron castings ASTM A-48, Class 25.
- B. Foundations: Shall be either precast units or poured in place reinforced concrete as detailed, set on undisturbed earth or select bedding, where required by the Engineer or detailed on the Drawings. Concrete shall be Class "B" 4,000 PSI as specified in Section 03300 "Concrete General"
- C. Bituminous Waterproofing: Shall be applied to the exterior of all concrete structures up to the ground line.
- D. Grout: Grout shall be commercial non-shrink, non-stain grout by Euclid or approved equal.

2-07 MATERIALS FOR SUPPLEMENTARY WORK

- A. Materials for supplementary work consisting of repairs and replacement of street paving, sidewalks, driveways, parking areas, clay gravel areas, curbs, lawns, grass plots and other related items shall conform to the respective Sections of these Specifications, or as specified on the Drawings.

2-08 BEDDING AND BACKFILL

- A. The pipe shall be installed in accordance with the requirements specified in Part 3, hereafter. Native material excavated from the trench may be used for backfill, where allowed by the Engineer from one foot above the top of pipe to the top of the trench. Such native material shall be non-organic, debris-free soil. Material required for select bedding and backfill is specified in paragraph B hereafter.
- B. Select Bedding and Backfill: Select bedding and backfill material shall be considered as material hauled in from off site. Material used in meeting this specification shall be measured or paid for separately and shall be only at the approval of the Engineer. Testing costs incurred for tests required to verify that material meets this Specification shall be borne by the Contractor.
 - 1. Select Bedding: Select granular material for bedding all pipe shall be crushed limestone aggregate or crushed gravel aggregate. The aggregate shall conform with the gradation sizing Number 67 specified in Table 2 of ASTM Standard Specification C-33 as follows:

GRADING REQUIREMENTS FOR COARSE AGGREGATE (ASTM C-33.
TABLE 2, SIZE 67)

PERCENT SIEVE SIZE
PASSING BY WEIGHT

1 Inch	100
3/4 Inch	90-100
3/8 Inch	20-55
No. 4	0-10
No. 8	0-5

2. Select Backfill: Select material for backfilling pipe trenches shall be select sand-clay material meeting the following gradation limits.

PERCENTAGE (BY WEIGHT)
SIEVE SIZE PASSING SQUARE MESH SIEVES

No. 10	30-100
The material passing the No. 10 sieve shall meet the following:	
No. 10	100
No. 40	20-85
No. 60	15-70
No. 200	8-40
The material passing the No. 40 sieve shall meet the following:	
Liquid Limit	25
Max.	
Plasticity Index (P.I.)	NP to 6 Max.

PART 3 - EXECUTION

3-01 GENERAL

- A. Install gravity sanitary sewer mains where shown on Drawings, in compliance with manufacturer's instructions.

3-02 SITE PREPARATION

- A. The Contractor shall prepare, on a timely basis, rights-of-way, easements and sites indicated on the Drawings for construction of the wastewater improvements. The work shall include clearing and grubbing, removal of structures and obstructions, and the removal of permanent surfaces and landscaping items designated to be restored upon completion of the installation.
- B. Clearing and grubbing shall conform to the requirements specified elsewhere herein and shall include the removal of trees, roots, vegetation, structures and obstructions unless separate pay items are specifically provided for on the Bid Form. The completion of clearing and grubbing shall leave the site clear and free from undesirable obstructions, ready for trench excavation.
- C. The removal of permanent surfaces and the subsequent restoration of the surfaces shall be as set forth below and in other sections herein where applicable.

3-03 REMOVAL OF PAVEMENT, SIDEWALKS, DRIVEWAYS AND CURBS

- A. Whenever the wastewater improvements are to be located along or across an improved surface, the width of the trench shall be held as nearly as possible to the maximum width specified below. Where brick or concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut

shall exceed the actual width of the top of the trench by twelve inches (12") on each side or a total of two feet (2'). Exposed surfaces of Portland cement or asphaltic concrete shall be cut with a pavement saw before breaking. Care shall be taken in cutting to insure that a straight joint is sawed.

<u>NOMINAL SEWER PIPE DIAMETER (INCHES)</u>	<u>MAXIMUM TRENCH WIDTH (FEET)</u>	<u>MAXIMUM WIDTH OF PERMANENT SURFACE AND CURB & GUTTER REMOVAL (FEET)</u>
12 or less	5.00	7.00
15	5.00	7.00
18	5.00	7.00
21	6.00	8.00
24	6.00	8.00
27	7.00	9.00
30	7.00	9.00

3-04 REMOVAL OF LANDSCAPE VEGETATION: Developed areas, yards, lawns, shrubbery and other decorative plantings that must be removed shall be stored and growth maintained by watering and fertilizing. The work shall be accomplished in accordance with prevailing local nursery practices with consideration given to seasonal limitations.

3-05 SELECTED STRIPPING: In landscaped, agricultural or cultivatable areas, the top twelve inches (12") of the ground shall be stripped and stockpiled for subsequent replacement after backfilling the pipe trench. The Contractor shall strip an area that will include the open limits of the trench plus the area that will be used to stockpile all suitable backfill material from the trench excavation. The stripped material shall be stockpiled in an area that will not hinder or endanger the construction process. The location and manner of stockpiling shall be reviewed by the Engineer.

3-06 EXCAVATION AND TRENCHING

- A. Excavation of every description and of whatever substances encountered shall be performed to the depths indicated on the Drawings or as otherwise specified. Excavation shall be done by open cut from the surface except when tunneling or boring is specified or directed in writing by the Engineer. Trench width shall be kept as narrow as practical to provide a safe working area and to minimize excavation, and shall be maintained in strict compliance with OSHA regulations.
- B. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Excavated materials not required or not suitable for backfill shall be removed and wasted as directed by the Engineer. Grading shall be done as necessary and at Contractor's expense to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other approved methods. Temporary sheeting and shoring shall be used where necessary for the protection of the work and for the **safety of the personnel.**

- C. During excavation, materials meeting select bedding and/or backfill requirements shall be either separately or selectively stockpiled for use as pipe bedding and pipe backfill material. Aggregate bedding material and sand material shall be handled and stockpiled in such a manner to prevent mixing with clay material when re-handled for backfilling.
- D. Excavation for manholes shall be sufficient to permit the carrying out of the construction as required.
- E. Trenches for process piping and other appurtenances shall be of only such width as necessary for proper laying of the pipe and for adequate select backfill. The net width of the trench at and below the top of the pipe shall be at least the pipe O.D. plus twenty four (24) inches. The width of the trench above this level may be as wide as necessary for sheeting, bracing, and shoring or **for proper safe performance of the work.**
- F. The sides of the trench shall be maintained in strict compliance with OSHA regulations.
- G. The bottom of the trench shall be carefully graded, formed and aligned according to these Specifications and reviewed by the Engineer's observer before piping is laid thereon. The bottom of the trench shall be hollowed under each pipe joint to conform to the shape of the pipe, and holes shall be cut for the bells, allowing the body of the pipe a uniform contact and support throughout its entire length.
- H. The Contractor shall leave a minimum 2 foot berm width on each side of the trench between the trench and the excavated earth, to allow the free passage of workmen, the Engineer's representative, and to permit work in a safe, expeditious and satisfactory manner.
- I. No more than three hundred (300) feet of trench shall be opened in advance of the completed sewer, nor shall more than one hundred (100) feet be left unfilled except by permission from the Engineer. In special cases, the Engineer, when so requested by the Contractor, may waive the distance restriction to which the trench may be opened by notifying the Contractor in writing.

3-07 TUNNELING OR BORING

- A. Tunneling will be permitted only where indicated on the Drawings or by special permission of the Engineer and in accordance with sections entitled – Roadway Crossings for Utility Lines or Horizontal Directional Drilling.

3-08 SHEETING, SHORING AND BRACING

- A. Sheeting, shoring, and bracing shall be furnished, placed and maintained by the Contractor as may be required to support the sides of the excavation. The Contractor shall be fully responsible for the sufficiency of such supports to prevent movement which can injure or delay the work or endanger or cause damage to adjacent pavements, buildings or other structures, channels and drainage structures, **or create undue hazards to workmen.** Where in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place. **The material and installation requirements for sheeting, shoring and bracing shall be in accordance with applicable sections of the Mississippi Standard Specifications for Road and Bridge Construction, latest edition.**
- B. Sheeting, shoring and bracing which are not ordered by the Engineer to be left in place shall be

removed in such manner as not to endanger the constructed sewer or other structures, utilities or property. Voids left or caused by the withdrawal of sheeting shall be immediately refilled with sand by tamping with tools specifically adapted to the purpose, by watering, or otherwise as may be directed.

3-09 EXCAVATED MATERIAL

- A. Excavated material from trench and structure excavation suitable for backfill shall be placed compactly on the sides of the excavation and kept up so as not to endanger the work and be of as little inconvenience as possible to the public travel and abutting property, and so that free access is maintained to fire hydrants and water valves in the vicinity of the work. Material encountered in the excavation which, in the opinion of the Engineer, is not suitable for use in the work, shall be removed and wasted as directed and shall not be stockpiled along the side of the excavation.
- B. The disposal of surplus and unsuitable excavation shall be the responsibility of the Contractor at his own expense. Surplus and unsuitable material not to be used in the construction of the project shall not be left on the right-of-way or easement of the project or adjacent thereto, except by written permission of the affected property owner.

3-10 DEWATERING

- A. The Contractor shall be solely responsible for implementation of adequate dewatering provisions.
- B. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of surface and ground water entering excavations, trenches or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed therein is complete to the extent that no damage from hydrostatic pressure, flotation or other cause will result. The normal water table shall be restored to its natural level in such a manner as not to disturb the pipe and its foundation.
- C. Excavations for trenches which extend down to or below static ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations eighteen inches (18") or more below the bottom of the excavation; except where the pipe is laid in an impervious strata, the lower trench section shall be maintained in a dry condition for bedding. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.
- D. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.
- E. The Contractor will be held responsible for the carrying capacity of pipe or conduit which he may use for drainage purposes. Pipes or conduits shall be kept clean and free of sediment or other restrictions.

3-11 STEEL SHEET PILING

- A. Unless required by the drawings, steel sheet piling shall be driven at locations to be determined by the Contractor as necessary for protection of buildings, structures, utilities, channels or to

prevent hazards to workmen. Piling may be new or used and shall be in such condition that it can be interlocked and driven satisfactorily.

- B. The Contractor shall be responsible for adequately bracing the units against lateral forces. Piling shall be driven before final adjacent excavations are made.
- C. Pile driving equipment used shall be maintained in first class condition and shall operate efficiently in the space provided. Equipment shall be subject to the review of the Engineer.
- D. **The material and installation requirements for sheet piling shall be in accordance with applicable sections of the Mississippi Standard Specifications for Road and Bridge Construction, latest edition.**

3-12 PIPE PLACEMENT

- A. General: Unless otherwise noted on the Drawings or directed by the Engineer, the bed for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench.
 - 1. When bell and spigot pipes or pipe couplings are used, spaces shall be cut to accommodate the bells or couplings. These spaces shall be deep enough to ensure that the bells or couplings do not bear the load of the pipes. When the pipes are laid, the barrel of each section of pipe shall be in contact with the quadrant shaped bedding throughout its full length, exclusive of the bell or coupling, to support the entire load of the pipe. Adjustments to line and grade shall be made by scraping away or filling in and compacting the earth under the body of the pipe and not by wedging or blocking up the pipe. Pipe shall not be laid on frozen ground.
 - 2. Before pipe is laid in the trench, the section in which pipe is to be placed must be dry and must be kept dry while joints are completed. Pipes, prior to being lowered into the trench, shall be thoroughly inspected by the Contractor's forces so that when jointed in the trench, there shall not be shoulders or unevenness along the lower half of the pipe. The faces of spigot ends and shoulders in the hubs or sockets shall be true. Abnormal enlargements on these faces shall be cut away before the pipe is lowered into the trench.
 - 3. The pipe shall be laid upstream, without breaks and with the bell end up grade. Whenever the work ceases for any reason, the unfinished end of the pipe line shall be securely closed with a tight-fitted plug or cover. Pipe shall be so placed and maintained, that at the time of final acceptance of the project, the completed lines will be true to the established alignment and flow line grades.
 - 4. Gravity sewer - Construction shall begin at the lowest point, or elevation, and the pipe shall be laid continuously upstream without omitting sections or reaches.
- B. The installation and joining of pipe shall be in strict accordance with the applicable ASTM or AWWA Standards and the pipe manufacturer's recommendations.
- C. The trench subgrade shall consist of firm, stable, non-organic, debris-free soil. In locations where trench excavation exposes unsuitable material, as classified by these specifications, or in the judgment of the Engineer, the subgrade shall be undercut as directed by Engineer for the full design width of the trench and backfilled with select bedding material meeting the requirements of Part 2-

08, herein, and installed in accordance with the requirements of Part 3-12.

3-13 PIPE BEDDING

- A. The pipe shall be placed on compacted select bedding material shaped and placed on the trench bottom. The initial lift and each successive bedding lift up to the level of 1 foot above the top of the pipe shall be placed in lifts of six (6) inches or less and should be compacted to not less than **92** percent of standard Proctor maximum dry density (ASTM D 698) by hand tamping or by utilizing a hand-held mechanical compactor. Material shall be in accordance with Paragraph 2-08. The moisture content within the bedding soils should be as required to provide a firm and stable condition for compaction. The bedding material shall be brought up simultaneously at the same level on both sides of the pipe. Backfill shall be placed and tamped equally and thoroughly along each side of the pipe in a manner to avoid displacement of or damage to the pipe.

3-14 ALIGNMENT

- A. The Contractor shall utilize a commercial grade laser beam specifically manufactured to aid in maintaining grade and alignment of gravity pipelines during installation. The primary unit shall be mounted on a heavy duty base and firmly anchored in the downstream manhole of the reach under construction. The maximum distance shall not exceed four hundred feet (400') per set up unless otherwise approved by the Engineer.
- B. Each joint of pipe will be installed using an approved target to align the pipe with the projected laser beam. The methods and procedures shall be in strict accord with the manufacturer's recommendations and instructions. Proper ventilation shall be maintained at all times. Care shall be exercised in order to prevent bumping or misalignment of the projected beam.

3-15 VYLON PIPE JOINT CONSTRUCTION

- A. Jointing and installation of Vylon PVC pipe shall be accomplished in accordance to the pipe manufacturer's recommendations. Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Field installed gaskets and field cut beveled lengths of pipe shall be done only in accordance with the manufacturer's instructions and recommended equipment and materials.

All pipe gaskets and spigots will be thoroughly cleaned and lubricated before assembly.

- B. Field cutting and sealing of the Vylon PVC pipe shall be accomplished in accordance with the manufacturer's recommendations. Contractor shall provide all equipment, labor and materials to properly seal cut sections of the pipe. All field cuts shall be sealed using 3M Scotch Guard DP-605 urethane sealant.

3-20 TRENCH BACKFILL:

Backfill shall consist of the material placed as indicated on the detail shown in the construction drawings. As pipe is laid and suitably bedded in accordance with these Specifications, trenches and excavation shall be promptly backfilled to a level 12" above the top of the pipe in relatively thin lifts with select backfill material defined in Part 2-08.

Backfill material placed from the trench level 12 inches above the pipe shall be placed per the following criteria. In undeveloped areas, the backfill should be compacted in relatively thin lifts (6"-8") to not less than **85** percent of standard Proctor maximum dry density. In developed areas where existing or future construction is planned, the backfill should be compacted in relatively thin

lifts to not less than **95** percent of standard Proctor maximum dry density. Excavations should be backfilled as soon as possible and special care and planning will be required in the area of existing structures. Contractor shall use extreme care and safety methods while excavating along the embankments to prevent instability of the embankments.

The final surface at the top of the backfill over the pipeline should be sloped to provide effective and rapid drainage of rainfall and surface water away for the pipe alignment. In areas where the existing drainage flows will allow the placement of additional material on top of the backfill, the backfill material should be crowned or mounded along the length of the pipeline in undeveloped areas at least 12 inches higher at the centerline and sloped downward to natural ground levels.

- A. Tamping: The backfill shall be placed in equal thickness lifts, each lift being thoroughly compacted to the density specified. Each lift of the backfill material shall have proper moisture content to permit compaction to this density.
- B. Jetting: This method of backfill shall not be used.

3-21 MAINTENANCE OF SITE

- A. The Contractor shall prevent, control and correct dust nuisance or muddy conditions developing on roadways as a result of his operation. No payment for maintenance of the site shall be made but shall be considered as a subsidiary obligation of the Contractor. The contractor shall provide adequate traffic control and warning signs to alert and protect the public during material deliveries and construction work near public roadways.

3-22 PIPELINE TESTING

- A. General: Before any backfill is placed, the sewer line shall be checked by the Engineer for line, grade and workmanship. Before acceptance, each section of the line between manholes or such other length as determined by the Engineer to be suitable, shall be thoroughly inspected and any defects in workmanship identified shall be immediately corrected.
- B. Deflection Tests: After installation, each segment of PVC pipe shall be checked for deflection by use of a "go-no-go" mandrel. Test sections may consist of more than one manhole segment at a time. Tests must be completed before live sewer is introduced into the new mains.
 - 1. The mandrel shall be constructed on one-half inch (1/2") thick angle iron or Number 4 steel bars (ASTM A-15) welded to steel pipe to measure a five percent (5%) deflection. The mandrel design must be approved by the Engineer.
 - 2. The average inside diameter of the pipe shall be used in calculating the five percent (5%) deflection.
 - 3. The line shall be flushed to clean any mud or debris which would hinder the mandrel passage.
 - 4. The mandrel shall be pulled by hand through the pipe after backfill and trench settlement has occurred.
 - 5. The system will be subject to a mandrel check at the eleven (11) month warranty inspection.
 - 6. If any irregularities or obstructions are encountered they shall be corrected by the Contractor at no expense to the Owner and the repaired section of the line again checked for excessive deflection.
- C. General: Before any backfill is placed, the piping shall be checked by the Engineer for line, grade and workmanship. Before acceptance, each section of the line between manholes, structures, valves or such other length as determined by the Engineer to be suitable shall be thoroughly inspected and

any defects in workmanship identified shall be immediately corrected.

- D. Location: Each individual joint of the installed sewer line shall be tested. Joint Testing: Prior to backfilling, each joint shall be tested from the inside of the pipe using a -Cherne "Air-Loc Joint Tester" or equal. Testing procedures shall be as described in ASTM C 1103, Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
- E. The Contractor shall submit for approval by the Engineer a large diameter pipe "joint tester" mechanism. Such mechanism shall be of standard manufacture and designed specifically to test large diameter pipe in accordance with ASTM C1103, latest revision.
- F. All test procedures and methods shall be in accordance with ASTM C1103, latest revision. G. The Contractor shall be responsible for all materials, methods, and safety during all testing.
- H. Test results must be submitted to the Engineer for approval prior to request for payment for the affected length(s) of pipe material. All test results must be submitted to the Engineer for approval prior to a final request for payment.
- I. The Contractor shall conduct either an exfiltration or an infiltration test of each reach of sewer between manholes. The entire system shall be tested. An infiltration test will be required where the crown of the entire reach of sewer pipe being tested lies three (3) feet or more under the existing water table. An exfiltration test shall be required for all other conditions. Specials, tees, manholes, plugs, service lines, etc. shall be designed and constructed to meet the infiltration/exfiltration requirements herein.
 - 1. Exfiltration tests shall be conducted by blocking off all manhole openings except those connecting with the reach being tested, filling the line and measuring the water required to maintain a constant level in the manhole. During the exfiltration test, the average water depth above the pipe invert shall be ten (10) feet, unless manhole depths are such that this is impossible. The maximum depth at the lower end shall not exceed twenty five (25) feet and the minimum depth at the upper end shall be at least five (5) feet above the crown of the pipe.

The total exfiltration shall not exceed one hundred (50) gallons per inch of nominal diameter per mile of pipe per 24 hours for each reach tested. For purposes of determining maximum allowable leakage, exfiltration tests shall be maintained on each reach for at least two (2) hours and as long as necessary (in the opinion of the Engineer) to locate all leaks.

The Contractor shall provide at his expense all the necessary piping between the reach to be tested, the test water, all labor and equipment required to complete the tests. The methods used and the time of conducting exfiltration tests shall be acceptable to the Engineer.
 - 2. The allowable infiltration rate shall not exceed one hundred (100) gallons per inch of nominal diameter per mile of sewer per day. For purposes of determining maximum allowable infiltration, manholes shall be considered sections of equivalent diameter pipe.

If the infiltration rate in any reach exceeds the allowable maximum, the reach shall be retested after the leaks are repaired.

The Contractor shall be required to repair all visible leaks although both the infiltration and the exfiltration requirements have been met.

The Contractor shall provide at his expense all necessary equipment, materials, and personnel required for the tests. The methods used and the time of conducting the infiltration test shall be acceptable to the Engineer.
- J. Air Testing

1. In lieu of the exfiltration test specified above, the Contractor may at his option, complete an air test in accordance with the following specifications. The air test shall in no case replace the infiltration test where ground water is present.
2. Procedure: The sewer line to be tested shall be tested between manholes in accordance with ASTM F-1417. The line shall be sealed at both ends. The seal at one end shall have an orifice through which to pass air into the pipe. An air supply shall be connected to the orifice at one end of the line. The air supply line will contain an on off gas valve and a pressure gauge having a range of 0 to 15 psi. The gauge shall have minimum divisions of .10 psi and shall have an accuracy of $\pm .04$ psi. Pressuring equipment should include a regulator or relief valve to avoid overpressuring and damaging an otherwise acceptable line.
3. The pipe line under test shall be pressurized to 4 PSIG. The line will be allowed to stabilize between 4 PSIG and 3.5 PSIG for a period of no less than 5 minutes. If necessary, air should be added to the line to maintain the pressure above 3.5 PSIG. After stabilization period, the gas valve shall be closed. When the line pressure drops to 3.5 PSIG, commence timing with a stop watch. The stop watch should be allowed to run until such time as line pressure drops to 2.5 PSIG. Then the watch should be stopped and time lapse compared with the allowable time lapse in **Table 1** at the end of this Section, and for pipe size and leakage allowance specified by the Engineer. If the time lapse is greater than that specified, the section undergoing testing shall have passed, and the test may be discontinued at that time. If the time is less than that specified, the line has not passed the test and the Contractor will be required to find the leaks, repair them and retest until the section passes, at his own expense.

3-23 FLUSHING

- A. The completed gravity flow system shall be free of mud, siltation and other foreign matter deposited or collected during construction. Flushing shall commence at the upstream end of the completed system and continue downstream manhole to manhole. Only water from an approved source will be permitted. Contractor shall furnish at his expense all flush water and pump water from the pipeline at the end of line flushing. **No water shall remain in the pipelines after testing and flushing the system.**
- B. Water used in flushing will not be permitted to enter into the existing system but shall be disposed of in a manner acceptable to the Engineer.
- C. Flushing shall be accomplished prior to testing should the collected matter be sufficient in quantity to obstruct or affect the testing. Flushing will not be required in those sectors of the installed pipes and manholes where the exfiltration test has adequately cleaned the mains.

3-24 CLEAN-UP

- A. After the backfill is completed, the Contractor shall dispose of surplus material, dirt and rubbish from the site. Surplus dirt shall be disposed of in Contractor furnished and approved disposal areas or in on site areas as directed by the Engineer.
- B. After work is completed, the Contractor shall remove tools and other equipment used by him, leaving the entire site free, clear and in clean condition.

Table 1

TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP TO 2.5 LAMENTS (Based on
0.003 cfm per sq. ft. and 2.0 cfm)

<u>Length of test section in ft.</u>	<u>Pipe Diameter in Inches</u>											
	<u>4</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>15</u>	<u>18</u>	<u>21</u>	<u>24</u>	<u>27</u>	<u>30</u>	<u>36</u>
25	4	16	22	28	93	62	89	121	158	200	248	356
50	10	33	43	55	158	124	178	243	317	401	495	713
75	19	49	66	83	240	186	267	364	475	601	743	1020
100	30	66	87	95	305	248	375	525	639	765	851	
125	41	82	109	110	349	372	510	650	680			
150	60	98	131	132	381	455	610					
175	79	115	153	154	413	575						
200	86	131	174	176	436							
225	95	147	196	294	459							
250	109	164	218	338								
275	113	189	240	382								
300	122	197	262									
350	131	213	306									
400	139	230	306									
450	147	246	306									
500	156	246	306									
550	165	246	306									
600	174	246	306									
650	183	246	306	382	459	575	610	650	680	765	851	1020

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**SECTION 33 41 00
STORM DRAINAGE**

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This item shall consist of furnishing all materials, labor, tools, equipment, and incidentals and performing all work necessary for the installation of pipe culverts, curb inlets, catch basins, and concrete headwalls and other specials in accordance with the Contract Documents. The work shall include all excavation, grading, backfill and other incidentals necessary for the installation of drainage structures as specified herein.

1-02 APPLICABLE DOCUMENTS

- A. The following publications form a part of this Specification and where referred to by basic designation only, are applicable to the extent indicated. Reference is to the later edition of each unless specified otherwise.

1. American Society for Testing and Materials (ASTM):

- a. C-76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
- b. C443 Joints for Circular Concrete Sewer and Culvert Pipe.
- c. C478 Precast Reinforced Concrete Manhole Sections.
- d. F667 Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

2. American Association of State Highway and Transportation Officials (AASHTO):

- a. M190 Bituminous Coated Riveted Corrugated Metal Culvert Pipe and Pipe Arches.
- b. M36 Corrugated Metal Culvert Pipe, Aluminum Coated.
- c. M294 Standard Specification for Corrugated Polyethylene Pipe, 12" to 24" diameter.

3. American Concrete Institute (ACI):

- a. ACI 301 Specifications for Structural Concrete for Buildings.
- b. ACI 318 Building Code Requirements for Reinforced Concrete.

- B. Local Building Codes: Any City, County and State Codes applying to the work.

- C. Standard Specifications for Road and Bridge Construction (MDOT): 2004 edition, as referenced herein.

1-03 SUBMITTALS

- A. Certified Test Reports: Before delivery of materials and equipment, certified copies of the reports of all tests specified herein or elsewhere shall be submitted to the Contracting Officer for review.

The testing shall have been performed in a laboratory meeting the Contracting Officer's approval. Test reports shall be accompanied by notarized certificates from the manufacturer certifying that the tested material and equipment is of the same type, quality, manufacture and made as that proposed to be supplied.

- B. Concrete Pipe: Certified copies of test reports shall include strength tests of concrete pipe. Strength tests for concrete piping shall be the three edge bearing tests. Test reports shall be furnished prior to installation of piping.
- C. Shop Drawings: Contractor shall supply shop drawings as specified herein or as directed by the Contracting Officer. Review of shop drawings by the Contracting Officer shall be required prior to incorporation of the subject item into the work.

PART 2 - MATERIALS

2-01 REINFORCED CONCRETE PIPE

- A. Shall conform to ASTM C76, Class III, Wall B minimum, unless otherwise specified. Joints shall be rubber gasket or bituminous plastic. Jointing shall be in conformance with the manufacturer's recommendations, applicable ASTM Standards, and MSHD Standards.

2-02 CORRUGATED METAL PIPE

- A. Shall be bituminous coated on the inside and outside. Manufacture of pipe, galvanizing and coating shall conform to AASHTO M190, Type A. Joints shall be fully bituminous coated coupling bands and conform to AASHTO M36. Bands shall not be less than 7 inches wide for pipe diameters from 8 inches to 30 inches, inclusive; and 12 inches wide for pipe with diameters from 36 inches to 60 inches, inclusive. Jointing shall be completed in accordance with the manufacturer's recommendations and applicable ASTM/AASHTO Standards.

2-03 CORRUGATED POLYETHYLENE PIPE

- A. Shall conform to ASTM F-667. Bands and jointing shall be installed and completed in accordance with the manufacturer's recommendations and applicable ASTM/AASHTO Standards.

2-04 CONCRETE

- A. Cement, reinforcement, forms, jointing and other incidentals shall be as specified in the Section "Concrete".
- B. All concrete work shall be in accordance with the provisions of "Building Code Requirements for Reinforced Concrete", ACI 318 and ACI 301. Any questions regarding acceptable concrete practice shall be decided by reference to ACI 301 and to ACI Standards listed in Chapter 4 of ACI 318.

2-05 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.

- B. The failure of the Contracting Officer to order the use of bracing or sheeting or the failure to order sheeting, bracing, struts, or shoring to be left in place, shall not in any way or to any extent relieve the Contractor of any responsibility concerning the condition of any excavation. Any delay resulting in keeping the excavation open longer than would have otherwise have been necessary, shall not relieve the Contractor of responsibility for properly and adequately protecting the excavation from caving or slipping at all times, nor from any of his obligations under the Contract relating to injury of persons or property.
- C. Installation of sheeting and shoring, or shoring left in place by the Contractor shall not entitle the Contractor to any claim for extra compensation.

2-06 INCIDENTAL MATERIALS

- A. Masonry brick shall conform to the standard specifications for sewer brick, made from clay or shale, ASTM C-32, Grade MS.
- B. Mortar: Portland Cement Mortar shall consist of one (1) part Portland Cement complying with ASTM C-150, Type 1, and three (3) parts mortar sand and sufficient water to mix mortar to proper consistency.
- C. Gray iron casting shall conform to the standard specifications for gray iron castings ASTM A-48, Class 25.
- D. Manhole Steps: Steps for manholes shall be cast aluminum alloy meeting the requirements of the Aluminum Association (Alloy AA-514) and Federal Specifications G4A.
- E. Foundations: Shall be either poured in place reinforced concrete as detailed, or precast sections set on undisturbed earth or select bedding, where ordered by the Contracting Officer or detailed on the Contract Drawings. Concrete shall be Class "B" as specified in Section 03300,"Concrete General" herein.
- F. Flared End Section: Shall be of the same class and type of pipe installed where specified.

PART 3 - EXECUTION

3-01 EXCAVATION

- A. General: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated or as otherwise specified.
- B. During excavation, material suitable for backfilling in the opinion of the Contracting Officer shall be stock piled in an orderly manner a sufficient distance from the banks of trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and wasted as approved by the Contracting Officer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved method.

3-02 TRENCHES

- A. The trenches shall be of the necessary width for the proper laying of the pipe, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded and shaped to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portion of the pipe where it is necessary to excavate for pipe bells or joints.
- B. Depressions for joints shall be dug after the trench bottom has been graded in order that the pipe rest upon the prepared bottom for as nearly its full length as practicable. Depressions shall only be of such length, depth and width as required for properly making the particular type of joint.
- C. Care shall be exercised not to excavate below the depth indicated. Over excavated depths shall be backfilled with loose, granular, moist earth, and thoroughly tamped.
- D. The width of the trench at and below the top of the pipe and the trench wall shall not exceed the pipe O.D. plus 16 inches.
- E. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as nearly the full length of the barrel as proper jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work. The pipe bed shall be prepared to the Contracting Officer's complete satisfaction.
- F. Whenever unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed for the full width of the trench and to the depth required. The trench shall be backfilled to the proper grade with an aggregate composed of coarse sand, fine gravel or other suitable material approved by the Contracting Officer. The backfill shall be thoroughly compacted and shaped to form a bed for the pipe.
- G. Select backfill or bedding hauled in from off site shall be included in the Lump Sum bid for the project. Use of select backfill from on site excavations shall not be eligible for separate or additional payment.

3-03 DEWATERING

- A. The Contractor shall perform all pumping or well pointing necessary to perform the excavation and to maintain excavation in dry state during the work. This shall be an absorbed cost and shall not be measured for separate payment.

3-04 BACKFILLING

- A. General: The trenches shall not be backfilled until the system as installed conforms to the requirements specified. The trenches shall be carefully backfilled with the excavated materials, approved for backfilling.
- B. Backfill material shall consist of earth, loam, sandy clay, sand and gravel or other approved materials free from large clods of earth or stones. Backfill shall be carefully rammed and compacted in place.
- C. Trenches within roadways shall be backfilled to the top of the subgrade or the ground surface in 6 inch layers, and each layer shall be compacted to a density at least 95% of maximum density as

determined by AASHTO Method T-99. The surface shall be graded to conform with the surrounding ground surface.

- D. Trenches in open areas shall be backfilled to a point one (1) foot above the top of the pipe in 6 inch layers. Each layer shall be compacted to a density of at least 90% of the maximum density as determined by AASHTO T-99. The remainder of the backfill above the 1 foot level shall be properly and carefully compacted to the density of the adjacent earth, and the surface shall be mounded over the trench and left in a uniform and neat condition satisfactory to the Contracting Officer.
- E. Trenches improperly backfilled in the opinion of the Contracting Officer shall be reopened to the depth required for proper inspection, then refilled and re-compacted as specified. There shall be no extra compensation for such corrective work.

3-05 PIPE LAYING

- A. Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe and tongue ends of tongue and groove pointing in the direction of flow in the case of concrete pipe. Corrugated metal pipe shall be laid with outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Corrugated polyethylene pipe shall be installed in accordance with ASTM recommended practice D-2321 and in accordance with manufacturer's recommendations.
- B. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to avoid sudden off sets of the flow line. As the work progresses, the interior of the pipe shall be cleared of all dirt and superfluous materials of every description.
- C. Trenches shall be kept free of water and pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work.
- D. Pipe shall be plugged or sealed at the end of work day to inhibit the entrance of foreign objects into the line.

3-06 JOINTS

- A. Concrete Pipe: Joints shall be rubber gasket complying with ASTM C-443.
 - 1. All rubber gaskets shall be extruded or molded and cured in such a manner that any cross section will be dense, homogeneous, and free of porosity, blisters, pitting, and other imperfections. The gaskets shall be extruded or molded to the specified size within a tolerance of $\pm 6\%$ on any dimension, measured at any cross section. The rubber gasket shall be fabricated from a high grade rubber compound. The basic polymer shall be natural rubber, synthetic rubber or a blend of both acceptable to the purchaser.
- B. Corrugated Metal Pipe: Joints shall be made with coupling bands. Bands shall be seated and made up tightly in accordance with the recommendations of the pipe manufacturer. The exterior surface of all bands and any other defects shall receive a field coat of bituminous paint.
- C. Corrugated Polyethylene Pipe: Joints shall be made with split couplings corrugated to engage the pipe corrugations, and shall engage a minimum of 4 corrugations, 2 on each side of joint. A neoprene gasket shall be utilized with the coupling to provide a soil tight joint.

3-07 CONSTRUCTION OF CONCRETE HEADWALLS

- A. General: Construction of concrete headwalls shall be of reinforced concrete and conform to dimensions, grades and details shown on the Contract Drawings. Forms for exposed surfaces of headwalls shall be provided with liners and chamfers strips. Chamfers shall be 3/4".
- B. Exposed surfaces of parapets and wing walls shall be given a rubbed finish with a medium coarse carborundum stone.
- C. The structures shall be cured for a minimum of 7 days. The structures shall be kept wet by the use of wetted burlap or may be cured with membrane curing compound.
- D. The headwalls shall be carefully backfilled to a density at least that of the surrounding ground. All costs involved in excavation and backfilling shall be included in the Lump Sum price for the project.

3-08 CONSTRUCTION OF CATCH BASINS, CURB INLETS AND STORM MANHOLES

- A. Brick masonry and concrete work for catch basins and inlets shall be constructed in conformity with the details shown on the Contract Drawings.
- B. Where irons or other fittings enter the brick work, they shall be placed as the work is laid up, thoroughly bonded, accurately spaced and lined. Upon completion of the masonry and settings of castings and fittings, the inside and outside surfaces of the brick masonry shall be neatly plastered with mortar to the thickness of one half (1/2) inch. Plastering shall be finished to a uniform, smooth surface and neatly pointed to all fittings.
- C. The concrete or brick and mortar shall be carefully constructed around the inlet and outlet pipes so as to prevent leakage and form a neat connection.
- D. Basins, inlets and manholes may be constructed partially or totally of precast reinforced concrete manhole sections and specials. All precast units shall comply with ASTM C-478 and joints shall be preformed plastic joints. Preformed plastic joint compound shall be "Butyl-Tite" as manufactured by Blue Ridge Rubber Company, Fletcher, North Carolina; "Kent-Seal" as manufactured by Hamilton Kent Manufacturing Company of Kent, Ohio; or approved equal. Preformed plastic joint compound shall meet Federal Specification SS-S-SS-00219 and AASHTO M-198.

3-09 CLEAN-UP

- A. After backfill of pipe and structures is completed, the area shall be graded to conform with the surrounding ground or to grade indicated, as applicable. The Contractor shall dispose of all surplus material, dirt and rubbish. Surplus material shall be deposited at locations and in a manner approved by the Contracting Officer.

3-10 INSPECTION

- A. Prior to final approval of the system, the Contractor and Contracting Officer shall conduct a thorough inspection of the entire installation. Any indication of defects on material or workmanship or any obstruction to the flow in the pipe system shall be corrected.

- B. All defects shall be corrected by the Contractor without additional compensation and in a manner acceptable to the Contracting Officer.

3-11 MAINTENANCE

- A. The Contractor shall be responsible, until final acceptance and without extra compensation, for the maintenance of all sewers and structures to the lines and grades established for the construction, for the stability of all backfills and the finished grades above the sewers and around the structures, and for the repair and replacement of all items which were damaged or removed during the construction. Restoration of pavement, base courses, driveways, curb and gutter, sidewalks and other items shall conform to the requirements specified in other sections of these Specifications.