OPPD

OPPD Elkhorn Storage Building No.1

Construction Documents
Project Manual

Construction Documents

November 10, 2023

HDR Project No. 3076/10373227

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SECTION 00 01 07

SEALS PAGE

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and that I am a duly **Registered Architect** under the laws of the State of Nebraska. Dana M. Blaschko 11/10/2023 Date Pages or sheets covered by this seal: Division 00 - all Division 01 - all Division 07 - all Division 08 - all Division 09 - all Division 13 - all	 November 10, 2023
I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and that I am a duly **Registered Engineer** under the laws of the State of Nebraska. John M. Savage 11/10/2023 Date Pages or sheets covered by this seal: Division 03 – all Division 05 – all	
I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and that I am a duly **Registered Engineer** under the laws of the State of Nebraska. Heather H. Ingerson 11/10/2023 Date Pages or sheets covered by this seal: Division 26 - all	 November 10, 2023
I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and that I am a duly **Registered Engineer** under the laws of the State of Nebraska. Kevin D. Moody 11/10/2023 Date Pages or sheets covered by this seal: Division 31 - all	 11/10/2023

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SECTION 00 26 00
SUBSTITUTIONS PRIOR TO BIDDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling requests for substitutions made prior to bid.

1. Any product proposed by Contractor which does not meet requirements of Contract Documents, whether in product characteristics, performance, quality, manufacturer, or brand name is considered a substitution.
2. In case of non-availability of materials contact Architect for review and action.

B. Manufacturers and Products: See Section 01 61 00.

C. For bidding purposes, base all bids on materials, equipment, and procedures specified, or approved by Addenda.

1.2 SUBSTITUTION PRIOR TO BID

A. Submit complete data substantiating compliance of proposed substitution with Contract Documents.

B. Products and Systems:

1. Product identification, including manufacturer's name.
2. Manufacturer's literature marked to indicate specific model, type, size, and options to be considered:
   a. Product description.
   b. Performance and test data.
   c. Reference standards.
   d. Difference in power demand, air quantities, etc.
   e. Dimensional differences from specified unit.
3. Samples:
   a. Architect reserves right to retain sample until physical units are installed on project for comparison purposes.
   b. Requester pay all costs of furnishing and return of samples.
   c. Architect is not responsible for loss of or damage to samples.
4. Name and address of at least five similar projects that proposed product has been in use on for at least four years, and name and phone number of owner's and architect's or engineer's representative, which Owner or Architect can contact to discuss product, installation, and field performance data.

C. Construction Methods:

1. Detail description of proposed method.
2. Illustrate with drawings.

D. Itemized comparison of proposed substitute to specified item; make variations clear.

E. Identify effect and changes required by other trades, subcontractors or contracts.

F. Data related to change in construction time.

G. Cost of proposed substitution in comparison with product, system or method specified.

H. Availability of maintenance and repair services, and sources of repair or replacement items.

I. Warranty comparison with specified product or system.

1.3 PRODUCT SELECTION

A. Certain types of products are described in Project Manual by means of trade names, catalog numbers or manufacturer's names, or both.

1. This is not intended to exclude products from consideration which may be capable of accomplishing purpose indicated.

B. Other types of products may be considered acceptable to Owner and Architect in place of those specified.

C. Listing of a manufacturer implies acceptance of them only as supplier of a product which complies with specified item.

1. See Section 01 61 00 for definition of Base and Optional manufacturers.

D. No substitution permitted after execution of contract, unless allowed by Contract Documents.

E. Conditional bids and voluntary alternates will not be considered unless allowed by Instructions to Bidders.

1.4 SUBSTITUTION REQUESTS

A. Only written requests with complete data for evaluation will be considered.

1. Request must be received by 3 workdays prior to bid open, by 2 P.M.
2. Requests received late will not be considered.
3. Submit evaluation data with attached form to Architect.

B. In making request for substitution, Suppliers represent:

1. Personal investigation of proposed product, system or method, has been conducted and determined it equal or superior in all respects to that specified, and will perform intended function.
2. Product, system or method is in full compliance with applicable codes.
3. Warranty for substitute item as for product, system or method specified meets or exceeds specified product.
4. Finish products shall comply relative to color and pattern with base specified items. Contractor will coordinate installation of accepted substitution into Work, to include building modifications if necessary, and be responsible for such modifications as may be required for Work to be complete and functional in all respects.
5. Certified cost data is complete and includes all related costs, excluding Architect's review and redesign cost.
6. Waives claims for additional costs or time extensions related to substitution which subsequently become apparent or are caused by substitution.
7. Pay additional costs to other trades, subcontractors or contracts caused by substitution.

8. Pay all Architect's review and redesign cost, special inspections, and other costs incurred by substitutions or revisions made necessary by acts or omissions of Contractor, due to product submittal or product not being ordered in a timely manner, due to ease of construction progress or Work, or which are in interest of or are for convenience of supplier, subcontractor or Contractor.
9. Acknowledge acceptance of these provisions.

C. Supplier to sign substitution request in space provided on form acknowledging acceptance of terms.

1.5 APPROVAL OF SUBSTITUTION REQUEST

A. No verbal or written approvals other than by Addenda will be valid.

1. Addendum listing approved substitutions will be published prior to Bid date.

1.6 REJECTION OF SUBSTITUTION REQUEST

A. Substitutions may not be considered if:

1. Submitted after stipulated date or time period.
2. Not submitted in accord with this Section.
3. Acceptance will require substantial revision of Contract Documents, building or system.
4. Substitution request does not indicate specific item for which request is submitted.
5. Substitution Request form is not properly executed and signed.
6. Substitution request for manufacturer acceptance only.
7. Insufficient information submitted.
8. Substitution color or pattern wise does not comply with base specified item.
9. Substitution does not appear to comply with requirements of specifications for base item.

END OF SECTION

SUBSTITUTION REQUEST

PROJECT:

PROJECT NUMBER:
To Office of Architect:

SPECIFIED PRODUCT:
Substitution request for: _____
Specification Section number: _____
Article(s)/paragraph(s): _____

REASON FOR SUBSTITUTION REQUEST:

- ☐ Fails to comply with building code requirements
- ☐ Unavailable to meet Project schedule
- ☐ No qualified installer for specified item
- ☐ Supplier refuses to warrant item or installation
- ☐ Supplier, Subcontractor or Contractor convenience
- ☐ Other:
- ☐ Not available
- ☐ Reduce Project construction time
- ☐ Project cost savings
- ☐ Unsuitable for application
- ☐ Constructability issue

Explanation in Detail: ☐ See attached: _____

SUPPORTING DATA:
Attach product description, specifications, drawings, photographs, performance data, test data, environmental criteria, and any additional data or information for evaluation of the proposed substitution in accord with requirements of Section 00 26 00.

Sample is included: Yes ☐ No ☐
Sample will be sent if requested: Yes ☐ No ☐
Maintenance Service Available: Yes ☐ No ☐
If yes, location: _____
Spare Parts Source: _____

PRODUCT/SYSTEM COMPARISON:
Provide a one-to-one comparison of proposed substitution with ALL specified attributes and qualities of specified item(s)

	SPECIFIED PRODUCT	PROPOSED SUBSTITUTION
Manufacturer:		
Name, brand:		
Catalog No.:		
Unit Cost:		
Attributes / Qualities / Variations / Warrantee / etc:		

REFERENCES:
LIST MINIMUM OF FIVE PREVIOUS INSTALLATIONS, WHICH PROPOSED PRODUCT HAS BEEN INSTALLED FOR AT LEAST FOUR YEARS:

Project: ______________________________
Address: ______________________________
Architect (name a phone): ______________________________
Owner (name & phone): ______________________________
Contractor: ______________________________
Date Installed: ______________________________
Dollar Value this Work: $ ______________________________

Project: ______________________________
Address: ______________________________
Architect (name & phone): ______________________________
Owner (name & phone): ______________________________
Contractor: ______________________________
Date Installed: ______________________________
Dollar Value this Work: $ ______________________________

Project: ______________________________
Address: ______________________________
Architect (name & phone): ______________________________
Owner (name & phone): ______________________________
Contractor: ______________________________
Date Installed: ______________________________
Dollar Value this Work: $ ______________________________

Project: ______________________________
Address: ______________________________
Architect (name & phone): ______________________________
Owner (name & phone): ______________________________
Contractor: ______________________________
Date Installed: ______________________________
Dollar Value this Work: $ ______________________________

Project: ______________________________
Address: ______________________________
Architect (name & phone): ______________________________
Owner (name & phone): ______________________________
Contractor: ______________________________
Date Installed: ______________________________
Dollar Value this Work: $ ______________________________

Project: ______________________________
Address: ______________________________
Architect (name & phone): ______________________________
Owner (name & phone): ______________________________
Contractor: ______________________________
Date Installed: ______________________________
Dollar Value this Work: $ ______________________________

EFFECT OF SUBSTITUTION:

Substitution affects other parts of Work: No ☐ Yes ☐ (If yes, explain below)
Substitution requires dimensional revision or redesign of structure or mechanical and electrical Work: No ☐ Yes ☐ (If yes, explain below)
Same warranty provided as specified base product: No ☐ Yes ☐ (If no, explain below)
Explanation: _____

Cost difference: $ _____ (add / deduct).
Total cost implications of substitution on Project: $ _____ (add / deduct).
Total time implications: $ _____ (add / deduct) calendar days.

STATEMENT OF CONFORMANCE OF REQUEST TO CONTRACT REQUIREMENTS:

Supplier, Subcontractor and Contractor in making substitution request or in using an approved substitution represent:

- ☐ Has personally investigated the proposed substitution and determined it is equal or superior in all respects to specified product or system and will perform intended function, except as stated above.
- ☐ Is in full compliance with applicable code requirements.
- ☐ Will provide same warranty for substitute item as for product, system or method specified.
- ☐ Will coordinate installation of accepted substitution into Work, to include building modifications if necessary, making such changes as may be required for Work to be complete in all respects.
- ☐ Waive all claims for additional costs or time extensions related to substitution that subsequently become apparent or are caused by substitution.
- ☐ If a finish product, color wise and pattern wise complies with base specified items.
- ☐ Certifies cost data presented is complete and includes all related costs under this Contract, excluding Architect's review and redesign cost.
- ☐ Will pay Architect's review and redesign cost, special inspections, and other costs caused by substitution.
- ☐ Will pay additional costs to other contractors caused by substitution.
- ☐ Will modify other parts of Work as may be needed, to make all parts of Work complete and functioning.
- ☐ Acknowledge acceptance of these provisions.

List of Attachments: _____

ACKNOWLEDGEMENTS:

FOLLOWING FIRM HEREBY REQUESTS CONSIDERATION OF FOLLOWING PRODUCT OR SYSTEMS AS A SUBSTITUTION IN ACCORD WITH PROVISIONS OF CONTRACT DOCUMENTS:

Supplier/Vender: _____
Acknowledged by (print & sign): _____ Date: _____
Position: _____ Phone _____

Subcontractor: _____
Acknowledged by (print & sign): _____ Date: _____
Position: _____ Phone _____

Contractor: _____
Acknowledged by (print & sign): _____ Date: _____
Position: _____ Phone _____

END OF SUBSTITUTION REQUEST

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DIVISION 01

GENERAL REQUIREMENTS

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SECTION 01 10 00
SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Future work.
5. Purchase contracts.
6. Owner-furnished products.
7. Contractor-furnished, Owner-installed products.
8. Specification and Drawing conventions.
9. Miscellaneous provisions.

B. Related Sections include but are not necessarily limited to:

1. Section 01 31 26 - Newforma Info Exchange Requirements.
2. Section 01 42 00 - References.

1.2 PROJECT INFORMATION

A. Project Identification: 10373227 OPPD Elkhorn Storage Building N0. 1

1. Project Location: 1101 N 180th St, Elkhorn, NE 68022

B. Owner: Omaha Public Power District 444 S. 16th St. Mall Omaha, NE 68102

1. Owner's Representative: Dan Grace

C. Architect: Dana Blaschko dana.blaschko@hdrinc.com

D. Contractor: To Be Determined.

1. See Section 01 31 26 for requirements for **administering and** using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Pre-Engineered Metal Building, with metal roof and wall panels, hollow metal doors, stairs, bollards, lighting, foundation, electrical power equipment, and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.

B. Owner-Furnished Products:

1. Palette Racking.

1.5 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations **published as part of the U.S. National CAD Standard**.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 13
REQUESTS FOR INFORMATION (RFI)

PART 1 - GENERAL

1.1 SUMMARY

A. Section specifies administrative and procedural requirements for handling and processing Requests for Information (RFI).

B. RFI is intended for requesting clarifications and interpretations of Contract Documents due to inconsistencies, errors or omissions in Contract Documents, and unanticipated existing conditions.

C. RFI is not intended for general communication, requesting substitutions, Contractor's proposed changes, resolution of nonconforming work, and coordination between contractors or for general questions not related to Contract Documents.

D. RFI process is a cooperative enterprise between Architect and Contractor to expedite RFI response and maintain progress of Work.

E. Architect shall evaluate alternate proposed methods of processing RFI's to that indicated within this Section for potential impact on Architect's services.

1. If Architect agrees to utilize another proposed method, Architect will be reimbursed for any special training, usage fees, extra time required to implement, maintain, utilize, and administer such a system.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 REQUESTS FOR INFORMATION

A. Review of Contract Documents and Field Conditions:

1. Contract Documents are complementary. Before starting each portion of Work, Contractor shall carefully study and compare various Drawings, Specifications and other Contract Documents, coordination drawings, shop drawings, prior correspondence or documentation relative to that portion of Work, as well as information furnished by Owner.
2. Contractor and Subcontractors shall evaluate and take field measurements of conditions related to that portion of Work and shall observe any conditions at site affecting it.
3. These obligations are for purpose of facilitating coordination and construction by Contractor and are not for purpose of discovering errors, omissions, or inconsistencies in Contract Documents.
4. Contractor and subcontractors acknowledge that all documents pertaining to Work has been examined, have examined character of site and any existing conditions, and are satisfied with nature of Work, and other matters which can affect Work.
5. In event of inconsistency between portions of Contract Documents or within Contract Documents; provide better quality or greater quantity of Work, and comply with more stringent requirement, either or both in accordance with Architect's interpretation.
6. Report errors, inconsistencies or omissions discovered in Contract Documents promptly to Architect as a properly prepared and timely RFI.
7. Contractor and Subcontractors are not required to ascertain Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, and rules and regulations, unless they bear upon construction means, methods, techniques or safety and health precautions, but the Contractor shall promptly report to Architect any nonconformity discovered by or made known to Contractor as an RFI.

8. On condition that Contractor or Subcontractor fail to give such notice, and knowingly proceeds with Work affected by errors or omissions in Contract Documents, Contractor shall correct any such errors, inconsistencies, or omissions at no additional cost.
9. Prior to bid, Contractor shall review existing facilities related to this contract and shall be familiar with utility requirements and construction.
    a. Existing facility documents may be available through Owner for review.
    b. Perform preliminary investigations as required to ascertain extent of Work.
    c. Conditions which would be apparent by such investigation will not be allowed as cause for claims for extra costs.

B. Contractor's and Subcontractor's Responsibilities:

1. Process request through Contractor when interpretation, clarification or explanation of portion of Construction Documents is needed by Contractor, Subcontractor, Vendor or Supplier.
    a. Review request for completeness, quality, proper referencing to drawing or specification section and reason submitted.
    b. In event request is not acceptable return to submitter with comments regarding reason for being returned.
    c. Make every attempt to validate, resolve or respond to RFI by thoroughly researching and reviewing Contract Documents and field conditions.
    d. Respond to RFI accordingly if review of RFI discloses a response or is related to coordination of construction or other issue not related to Contract Documents.
    e. If request is unclear, rewrite and state in clear, concise, correct, complete and easily understood manner.
        1) Include additional information if necessary and submit to Architect for response.
2. Submit request for interpretation, clarification or explanation of Contract Documents to Architect through Contractor.
    a. List specific Contract Documents researched when seeking information being requested.
    b. Reference applicable Contract Drawings by sheet number, section, detail, room number, door number, etc., Specifications by section and paragraph number, and reference other relevant documents.
    c. The field titled "Regarding" on attached RFI form must be clear for future reference in reports or correspondence.
    d. Clearly state request and provide Contract Document references and any additional information needed so request can be fully understood, including sketches, photos or other reference material.
    e. Fully assess issues, suggest any reasonable solutions and include various factors, including potential costs, schedule impacts, if any, and recommendations which will aid in determining a solution or response.
        1) In event a reasonable solution cannot be suggested, a statement to that effect should be so stated.
    f. Indicate reason request is being submitted.
    g. Clearly indicate critical RFI's requiring a rapid response with an explanation as to why RFI is critical.
    h. Indicate priority for responses when multiple RFI's are submitted within short period of time.
3. Distribute copies of responses to RFI's to all parties affected.
4. Response to RFI shall not be considered a notice to proceed with a change that may revise the Contract Sum or Contract Time, unless authorized by Owner in writing.

5. In event response to RFI is determined incomplete, resubmit with explanation for unacceptability of response and necessary additional information within five (5) days of receipt to RFI response.
6. On condition Contractor determines or believes additional cost or time is involved due to clarifications, interpretations or instructions issued by Architect in response to a RFI, resubmit RFI within five (5) days of receipt of response with reason and alternate solution or suggestion for performing work at no additional cost.
    a. In event no other solution is possible or desirable, submit Claim in accordance with Contract Documents within twenty-one (21) days of receipt of response to RFI.

C. RFI Submittal Process:

1. Process and submit RFI's to Architect by Contractor utilizing web-based application, Newforma Info Exchange (Newforma).
    a. A unique username and password will be assigned to Contractor for access to system, project data and submittal of RFI's.
    b. Employ systems RFI module to submit RFIs by Contractor.
    c. Insert entire question or requested information in "Question" portion of system.
    d. Electronic file of sketches, photos or other pertinent information may be uploaded with a RFI request in system to clarify request.
    e. RFI automatically receives current date stamp upon submittal of RFI in system.
    f. System will assign a unique RFI number in sequential order (1, 2, 3, 4, etc.).
    g. In event previously submitted RFI request requires revision to provide additional information, initiate a new RFI.
        1) New RFI shall be renumbered with previous submitted RFI succeeded by ".1 " to indicate revision one of RFI (i.e.: RFI No. 34.1 for revision 1 to RFI No. 34).
2. Architect will respond to RFI's utilizing Newforma.
    a. Architect may upload electronic files with RFI response in system to help clarify response.
    b. Upon response to RFI by Architect, the current date will be automatically entered into system.
    c. To protect responding data from being altered, "Answer" portion of screen and submitted date cannot be changed once RFI has been closed.
3. After receipt of RFI response, the system can be accessed for RFI response, attachments and printing.
4. Status of RFI's submitted and data regarding RFI's may be viewed or printed from system.
5. RFIs and a variety of different RFI summaries, and filtered reports may be generated, viewed, or printed from system.

D. RFI Submittal Format:

1. Submit request for information to Architect on RFI form provided at end of this section, form provided by Architect in electronic text file format, or in similar format acceptable to Architect.
    a. Electronically complete and email RFI form to Architect's designated representative in text file format.
    b. Attachments shall be in electronic text or PDF file format.
    c. Photo attachments may be in JPG format.
2. Assign RFIs with unique numbers in sequential order (1, 2, 3, 4, etc.).
3. Assign RFIs with assigned unique numbers in sequential order (1001, 1002, 1003, etc.) using the 1000 series numbers.
4. A resubmitted RFI or a previously answered RFI requiring revising or further clarification shall be submitted using original RFI number proceeded by ".1 inches to indicate revision one of RFI (i.e.: RFI No. 34.1 for revision 1 to RFI No. 34).

E. Architect's Response to Request for Information (RFI):

1. Clarifications, interpretations and decisions of Architect in response to RFI will be consistent with intent of and reasonably inferable from Contract Documents, in writing, and may be provided in form of drawings and other attachments, or both.
2. When making such interpretations and decisions, Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.
3. Architect's decisions on matters related to aesthetic effects will be final if consistent with intent expressed in Contract Documents.
4. Architect will not undertake to settle differences between Contractor, Subcontractors, trades suppliers, fabricator or manufacturer, or act as arbiter as to which Subcontractor, trade, supplier or manufacturer is to furnish or install various items indicated or required.
5. Architect shall provide responses to RFI's with reasonable promptness but will endeavor to respond within twenty-one (21) days from date of receipt.
    a. If multiple RFI's are submitted on same day or within a five (5) day period, review time may be extended by mutual agreement of parties.
    b. Architect will provide a written response to RFI if Architect believes response only involves an interpretation, clarification, supplemental information or orders a minor change in Work not involving an adjustment in Contract Sum or extension of Contract Time, and is not inconsistent with intent of Contract Documents, and shall be binding.
    c. If Architect believes response may result in a change to Contract Sum or Contract Time, response will indicate that a change document will be issued for the response, and appropriate change document will be issued indicating changes to Contract Documents.
    d. Architect will provide any additional or supplemental drawings, specifications or other information as Architect may deem necessary to facilitate response.
6. Architect may return RFI without response for following reasons:
    a. Is considered a "Contractor Proposed Change".
    b. Response is consistent with the intent of the Contract Drawings.
    c. Request is unclear or incomplete.
    d. Is due to Contractor's lack of adequate coordination.
    e. Is related to construction means, methods or techniques.
    f. Response is required by another party.
    g. Is considered a "Substitution Request."

F. If requested information is available from careful study and comparison of Contract Documents, field conditions, other Owner-provided information, coordination drawings, or prior Project correspondence or documentation, Architect may invoice Owner as a change in services for costs involved in Architect's review, analysis, responding and processing of such RFI.

1. Contractor shall reimburse Owner for such costs.

G. Contractor and Subcontractors may anticipate receiving two (2) clarifications, interpretations, orders for Minor Changes in Work or responses to valid requests for interpretations or clarifications of Contract Documents.

END OF SECTION

REQUEST FOR INFORMATION

Project: RFI Number: _____

Project No.:

☐ (other?) ☐ Action ☐ Info Pages _____

Regarding: _____

References: (List specific Contract Documents researched when seeking the information being requested)

Spec. No.: Dwg. No.:

Request: (Provide complete description of request with document references and sketches or photos if necessary, and present status of work)

Requester's Recommended Solution: (If RFI concerns a site or construction condition, provide a recommended solution, including cost & schedule considerations)

Response Priority: ☐ Normal ☐ Rush (Work in progress)

Reason For Request: ☐ Existing Condition ☐ Non-conformance ☐ Clarification / Interpretation ☐ Agency Generated ☐ Other

Subcontractor: _____ Date: _____

CM/Contractor:

By: Date:

Response:

END OF FORM

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SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

A. The Architect will schedule and hold preconstruction conference prior to construction.

B. Attendance Required:

1. Owner:
    a. Project Representative.
    b. Director of Operations or Engineering.
2. Architect.
3. Contractor:
    a. Home office representative.
    b. Field Project Manager.

C. Contractor must be prepared to discuss the following items:

1. List of subcontractors.
2. Tentative construction schedule.
    a. Start and completion dates.
    b. Critical work sequence.
3. Status of Contract, bonds, and insurance.
    a. Accepted alternates.
4. Procedures.
5. Designation of responsible personnel.
6. Processing of field decisions and change orders.
7. Submittal process.
8. Procedures for maintaining record documents.
9. Use of premises:
    a. Office and storage areas.
    b. Owner’s requirements.
10. Submission and processing of monthly Application for Payment and associated requirements.
11. For projects requiring demolition of existing structures address removal and disposal of hazardous materials and toxic substances as applicable.

D. Contractor to conduct a meeting with subcontractors after preconstruction conference to discuss procedures.

1.2 CONTRACTOR MEETINGS

A. Conduct weekly progress, coordination and scheduling meetings with subcontractors.

1.3 PROGRESS MEETINGS

A. Attend scheduled meetings; time, day and place to be determined.

1. Generally, meetings will be held monthly or as required by progress of the Work and scheduled to coincide with Architect’s regular scheduled site visits.
2. Meetings to be held at job site or as arranged.
3. Contractor administer meetings and record minutes.

B. Attendance Required:

1. Owner's Representative.
2. Architect's Representative.
3. Contractor:
    a. Home office representative.
    b. Field Project Manager.
    c. Superintendent.

C. Agenda:

1. Review, approve minutes of previous meeting.
2. Review work progress since last meeting.
3. Planned progress during next work period.
4. Review construction schedule.
5. Identify concerns which impede planned progress.
6. Note field observations, questions, and decisions.
7. Review submittal schedules.
8. Review Owner/Contractor coordination items.
9. Review status of changes.

1.4 PREINSTALLATION CONFERENCE

A. Contractor administer meetings and record minutes.

1. Convene affected parties for coordination where required by Contract Documents.
2. Conduct meetings prior to installation of the Work.
3. Meetings to be held at job site or as arranged.

B. Attendance Required:

1. Owner's Representative.
2. Architect's Representative.
3. Contractor:
    a. Field Project Manager.
    b. Superintendent.
    c. Fabricator or Supplier.
    d. Installer.
    e. Others whose work may affect or be affected by installation.

C. Agenda:

1. Review or inspect existing conditions.
2. Review submittals.
3. Review construction schedule and identify concerns.
4. Review Owner/Contractor coordination items.
5. Discuss mobilization and delivery.
6. Note field observations, questions, and decisions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 26
NEWFORMA INFO EXCHANGE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Newforma Info Exchange (Newforma) will be utilized on this Project for collaboration and certain administrative functions.

1.2 CONTRACT MANAGEMENT COLLABORATION PLATFORM

A. Newforma Info Exchange is a web-based application furnished by Architect at no cost to Owner and Contractor.

B. Contractor will have access to projects and modules for which they have permissions.

C. Architect will manage and administer Newforma Info Exchange.

D. Enables project team to receive submission of items, review status of documents and supports management of project information.

E. Allows tracking, corresponding, sharing, viewing and access to shared project information.

F. Certain documents will be distributed by Architect by means of Newforma.

G. Newforma Help Guide is available via http://help.newforma.com.

1.3 HARDWARE REQUIREMENTS

A. Device with high-speed internet connection.

1.4 SOFTWARE REQUIREMENTS

A. Web Browser: All are supported.

B. Additional applications: MS Word, MS Excel, imaging software to open TIFF and JPEG attachments.

C. Email application and service.

1.5 ACCESSING HDR NEWFORMA INFO EXCHANGE

A. Once access is granted by HDR, external users are given permissions to join the project team. Web access will be provided by Newforma. Each individual team member will establish and maintain their own credentials.

1. Where an individual works on multiple HDR projects, these credentials will apply to all projects similarly.

B. Access Newforma from a web browser at https;//Newforma.hdrinc.com/userweb.

C. External user logging in to Newforma Info Exchange:

1. Newforma will prompt to login with Username and Password.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 MODULES / FUNCTIONS

A. Verify with HDR's project Construction Contract Administrator which Newforma modules will be made available to Contractor and the document nomenclature which will be used.

B. Contractor will utilize following Newforma modules:

1. Submittals:

a. Samples and finish materials shall not be submitted electronically.
b. Other Submittals - Contractor to submit electronically:
    1) Submit as PDF documents.
    2) Name PDF file beginning with relevant spec section.
    3) Include Sender ID where applicable to allow for coordination between Architect's and Contractor's systems.
    4) Do not submit file in Adobe PDF/A mode.
    5) Transmitting submittal files with Newforma Info Exchange:
        a) Sign into Info Exchange.
        b) Select assigned project.
        c) Select Send Submittal.
        d) Enter information in fields regarding submittal.
            (1) To: Designated project submittal processor.
            (2) CC: Other designated personnel.
            (3) Title using the Section name and submittal type: e.g. "08 71 13 AUTOMATIC DOOR OPERATORS | Shop Drawings".
            (4) Select specification Section in the pull-down menu.
            (5) Add Remarks as needed to differentiate submittal from similar submittals.
            (6) Assign Action from menu options.
        e) Attach supporting files.
        f) No further action is required by the contractor until they received notice of a response. Access to view current status of each submittal is available via Info Exchange.
c. When submittals have been reviewed and posted, they will appear in the Response column of the submittal log.
d. Contractor will have access to related files in Newforma Info Exchange.
e. See Section 01 33 00 - Submittal Processing for additional requirements.

2. Request for Information (RFI):
    a. Contractor shall create new RFI's using Newforma Info Exchange in order to request information from Architect.
    b. Architect will access requested information and any attachments.
    c. Contractor will access Newforma Info Exchange to view status, response and any attachments.
    d. See Section 01 26 13 - Requests for Information for additional information.
3. Proposal Requests (PR):
    a. Architect will notify Contractor by email when document has been issued and available in Newforma Info Exchange.
    b. Contractor will download electronic documents for further processing directly from the email notification or by accessing Newforma Info Exchange.
4. Architect's Supplemental Instructions /Clarification-Interpretation (ASI/C-I):
    a. Contractor will be notified by email when document(s) are available in Newforma Info Exchange.
    b. Contractor will download electronic documents for further processing directly from the email notification or by accessing Newforma Info Exchange.
5. Construction Change Directives (CCD):
    a. Contractor will be notified by email when document(s) are available in Newforma Info Exchange.
6. Change Proposal Requests (CPRs):

a. Contractor will be notified by email when document(s) are available in Newforma Info Exchange.
b. Contractor will download electronic documents for further processing directly from the email notification or by accessing Newforma Info Exchange.

7. Deliverables:
   a. Architect will post Contract Documents on Newforma Info Exchange.
   b. Contractor may access documents posted to Newforma Info Exchange.

END OF SECTION

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Shop Drawings, Product Data, Samples, Project Information submittals including Contract Closeout submittals.

B. Provisions of this Section take precedence over provisions in General Conditions of the Contract for Construction governing Shop Drawings, Product Data, Samples, Project Information and Contract Closeout Information submittals.

C. Submittals are not to be used as means for substitution requests.

1. Submittals that include substitutions will be returned without review or action.

D. Contact Architect in event of non-availability of specified product due to strikes, lockouts, bankruptcy, production discontinuance, proven shortage, or similar occurrences.

1. Notify Architect, in writing, with substantiating data as soon as non-availability becomes apparent.
2. Notify in time to avoid delay in construction.

E. Appropriateness and accuracy of calculations is responsibility of Contractor, and Contractor's Professional Structural Engineer when such calculations are required to be professionally sealed.

F. When professional or other certification of performance criteria of materials, systems or equipment is required by Contract Documents, Architect shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

1.2 DEFINITIONS

A. General:

1. Submittals are not Contract Documents.
2. Purpose of submittals is to demonstrate way by which Contractor proposes to conform to information given and design concept expressed in Contract Documents for those portions of Work for which Contract Documents require submittals..

B. Shop Drawings Action Submittals:

1. Drawings to scale, diagrams, schedules and other data specially prepared for Work by Contractor or a Subcontractor, sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of Work.

C. Product Data Action Submittals:

1. Illustrations, standard schedules, performance charts, instructions, brochures, color charts, performance curves, diagrams, test data and other information furnished by Contractor to illustrate material, product, equipment or system for some portion of Work.

D. Samples Action Submittals:

1. Physical examples which illustrate size, kind, pattern, texture, materials, equipment, systems or workmanship and establish standards by which Work will be judged.
2. Samples also include job site Mock-ups and sample construction.

E. Project Information Submittals:

1. Examples of Information Submittals, which do not require review or action by Architect, include, but are not limited to:

a. Progress Reports
b. Contractor Coordination Drawings
c. Bonds.
d. Construction Schedules.
e. Manufacturer's Installation or Adjustment Instructions.
f. Statements of Qualifications.
g. Certificates.
h. Field Service, Laboratory Test.
i. Start-Up Reports,
j. Design Calculations.
k. Material Safety Data Sheets.
l. Safety Programs and Reports.
m. Other Information Submittals identified in individual specification sections.

F. "Contract Closeout Information" Submittals:

1. Items pertaining to quality control and Owner information, which are required at Substantial or Final Completion, and do not require review or action by Architect.
2. Architect may review at its sole discretion, for general compliance with Contract Documents only.
3. Review will not constitute a detailed check of submitted design calculations.
4. Examples of Contract Closeout Information Submittals, which do not require review or action by Architect, include but are not limited to:
   a. Pre-occupancy test reports.
   b. Operation and Maintenance Data.
   c. Warranties and Guarantees
   d. Owner instruction reports.
   e. Project Record documents.
   f. Extra materials or tools.
   g. Other Submittals identified in individual specification sections.

G. Manufacturers and Products, Base and Optional: See Section 01 61 00.

1.3 SUBMITTALS

A. Project information:

1. Schedule of Submittals:
   a. Provide in advance of transmittal of first submittal and prior to first application for payment.

1.4 SCHEDULE OF SUBMITTALS

A. Complete Schedule of Submittals shall include Shop Drawings, Product Data, Samples, Project Information, and Contract Closeout Information required by specification section Submittal paragraphs.

1. Submittals Schedule shall be mutually agreed upon, in writing, by Architect and Contractor.
2. Contractor or Subcontractors may require submittals for their coordination purposes even when submittals are not required by Contract Documents for Architect's review. Do not include or submit such submittals to Architect.
3. Schedule shall be in horizontal bar chart format divided by weeks. Indicate proposed submittal dates for each submittal.

4. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.
    a. Allow at least two weeks for Architect's review and processing of each submittal, excluding mailing.
5. Coordinate each submittal with fabrication purchasing, testing, delivery, other submittals and related activities that require sequential activity.
6. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
7. Architect reserves the right to withhold action on a submittal which, in the Architect's opinion, requires coordination with other submittals until related submittals are received, and will notify the Contractor, in writing, when he exercises this right.
8. Do not include or submit items not required to be submitted by Contract Documents.
9. Arrange submittals by specification section.
    a. Submittals shall include items from one specification section only.
    b. Submit Shop Drawings, Product Data, Samples, and Project Information (except for Field Test Reports) items specified in a section at same time for a complete review.
        1) Shop Drawings: Individual submittal item.
            a) Subparagraphs represent description of items to include on separate or combined drawings in the submittal.
            b) Indicate additional submittals that will be generated as result of dividing required submittal by building, floor, area of a floor, or other phased subdivision.
        2) Product Data: Individual submittal item.
            a) Subparagraphs represent description of items to include as part of single submittal.
        3) Sample and Information submittals:
            a) Each subparagraph represents an individual submittal item.
10. Indicate submittals that will be provided to agencies having jurisdiction. Schedule sufficiently in advance of date required to allow agency reasonable time for review, and Contractor resubmission if necessary, and to cause no delay in Work or in activities of Owner or other contractors.
11. Submit all submittals required by a section at same time which are needed for a complete review except Contract Closeout Information Submittals and Shop Drawing submittals divided by building area or construction phasing.
12. Do not submit large quantities of submittals at one time.
13. Schedule Contract Closeout Information submittals during last quarter of construction period and prior to Substantial Completion.
14. Partial payment requests may be withheld until satisfactory Schedule of Submittals has been received.

1.5 SHOP DRAWINGS

A. Shop Drawing Action Submittals are required as called for in each specification section Submittal paragraph.
    1. Do not use Contract Drawings as Shop Drawings.
B. Submit high quality, high contrast copy of Shop Drawings in Portable Document Format (PDF).
    1. Use Newforma Info Exchange. See Section 01 31 26 for specific information.

1.6 PRODUCT DATA

A. Product Data Action Submittals are required as called for in each specification section Submittal paragraph.

B. Submit high quality, high contrast copy of Product Data in Portable Document Format (PDF).

1. Use Newforma Info Exchange. See Section 01 31 26 for specific information.
2. Include index if multiple items under specification section are included in submittal.
3. Mark each copy to show exact item, model, and options submitted for review.
4. Show compliance with specified reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances; notation of coordination requirements.
5. Mark through items on manufacturer's standard sheets which are not being proposed. Submittals without indications and deletions will be returned without review.
6. Include scale details, sizes, dimensions, performance characteristics, capacities, wiring diagrams, controls and other pertinent data.

1.7 SAMPLES

A. Sample Action Submittals are required as called for in each applicable specification section Submittal paragraph.

1. Identify samples with manufacturer’s name, item, use, type, Project designation, specification section or drawing, detail reference, color, range, texture, finish and other pertinent data.
2. Send samples to address indicated, or Project site if required or requested.
3. Samples shall have a label affixed or attached thereto of sufficient size to accommodate Contractor’s approval stamp.
4. Submit one sample of each color or type indicated.

B. When specific colors, textures, or patterns are not specified, submit samples from full range of manufacturer's standards for selection. When custom or standard finishes are specified, submit samples of specified colors, textures or patterns.

1.8 PROJECT INFORMATION AND CONTRACT CLOSEOUT INFORMATION

A. Project Information and Contract Closeout Information submittals are required as called for in each specification section Submittal paragraph.

B. Submit high quality, high contrast copy of Project Information and Closeout Information in Portable Document Format (PDF).

1. Use Newforma Info Exchange. See Section 01 31 26 for specific information.

1.9 SUBMITTALS REQUIRING PROFESSIONAL SEALS AND SIGNATURES

A. Shall be submitted per following:

1. Unless otherwise agreed to by Architect, submit to Architect for records one original, or high quality high contrast copy of submittal suitable for reproduction, unless quantity is indicated elsewhere. Submit quantity indicated in specifications sections to Owner.
2. Architect is not required to return submittal.
3. Do not fold. Submit in envelope large enough for submitted items.

1.10 TRANSMITTAL

A. Contractor is responsible for making submissions.

1. Electronic submittals shall be submitted utilizing Newforma Info Exchange. See Section 01 31 26 for specific information.
2. Submit samples and submittals that require hard copies to office of Architect:

HDR Architecture, Inc.
1917 S 67th St
Omaha, NE 68131
Attention: John Savage

B. Transmit items with Submittal Transmittal form included at end of this section, or supplied by Architect, or similar format approved in advance by Architect.

1. Contact Architect for copy of form for Project use.
2. Indicate Project name, Architect's project number, specification section title, description of submitted items or systems, manufacturer and submittal type on transmittal form.
3. Indicate submitted date, approval and sign in appropriate space on transmittal form.
4. Submittal Transmittal form shall stay with submittal throughout its routing.
5. Indicate submittal number in space provided on Submittal Transmittal form. Following submittal numbering system shall be used:
   a. Identify each submittal using applicable 5 or 6 digit specification section number from Contract Documents.
   b. After section number, indicate sequence number. First submittal of section series would be numbered "######-1, next would be "######-2, etc.
   c. If returned for re-submission, add a designation character. Second submission would be "######-1a", third would be "######-1b", etc.
6. Indicate description of submitted items including drawing numbers, etc.
7. Indicate "Submittal type" being submitted.

C. Submittals shall only include items from one specification section.

1. Project Information Submittals and Contract Closeout Information Submittals shall be submitted separately from other submittals required by specification section.
2. Submit all items specified in section at same time for complete review, except Contract Closeout Information Submittals.

D. Do not submit following:

1. Submittals not required by specification section Submittal paragraph.
2. Submittals required by other contractors or trades for their coordination that are not required by specification section Submittal paragraph.
3. Submittal of products, systems or manufactures not specified.
4. Submittal of substitution.
5. Submittal of MSDS information.
6. Large quantities of submittals at one time.

E. Do not mark copies with highlighters that black out information, or turn opaque when reproduced, or will not scan or reproduce legibly.

1.11 CONTRACTOR AND SUBCONTRACTOR ACTION

A. Submit submittals required by Contract Documents in accordance with submittal schedule approved by Architect or, in absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in Work or in the activities of Owner or of separate Contractors.

B. Direct specific attention in writing with submittal or on submittal, indicating deviations from requirements of Contract Documents.

1. Contractor shall not be relieved of responsibility for any deviation from requirements of Contract Documents by Architect's approval of submittals unless,
   a. Contractor has specifically informed Architect in writing of such deviation at time of submission, and

b. Architect has given written approval to specific deviation as a minor change in Work, or
c. a Change Order or Construction Change Directive has been issued authorizing the deviation.

2. Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.
3. Completed Work shall match appearance of approved samples and mock-ups.

C. Contractor represents and warrants that submittals shall be prepared by persons and entities possessing expertise and experience in the trade for which submittal is prepared, and if required by Architect or applicable law, by a licensed Professional Engineer or Structural Engineer, or other specialized Engineer, where so stipulated.

D. Contractor is responsible for confirmation and correlation of dimensions at Project site; for information that pertains solely to fabrication processes or to techniques of construction; and for coordination of work of trades.

E. Contractor and Subcontractor shall review submittal required by Contract Documents for compliance with Contract Documents, approve and submit to Architect.

F. Submittal to Architect indicates Contractor, Subcontractor represent they have:

1. Reviewed submittal for compliance with the Contract Documents and has approved submittal;
2. Determined and verified field measurements, and field construction criteria related thereto, or will do so;
3. Determined and verified quantities, materials, performance criteria, installation requirements, catalog numbers and similar data related thereto;
4. Determined substitutions have not been included;
5. Checked, determined, verified and coordinated information contained within such submittals with requirements of Work, Contract Documents and other submittals;

G. Resubmit items returned by Architect and marked "Revise and Resubmit" or "Not Approved" until approval is received.

1. Direct specific attention, in writing, or on resubmitted submittals to revisions other than those requested by Architect on previous submittals.
2. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.
3. Bubble or otherwise clearly identify all changes from previous submittal.
4. Tag each re-submittal with a designation that reuses the previous submittal number and a suffix designating the re-submittal sequence in accordance with the numbering system indicated in this section.

H. Contractor shall reproduce and distribute copies of submittals after Architect's review to:

1. Project site: Copy of "Approved" or "Approved as Noted" submittals for use by Contractor's field staff, Owner and Architect's representatives.
2. Subcontractor or vendor.
3. Other Contractors, Subcontractors or vendors as may be required for coordination purposes.
4. Owner: Copy of "Approved" or "Approved as Noted" submittals.
5. Authorities having jurisdiction: Copy of "Approved" or "Approved as Noted" submittals if required by Authority Having Jurisdiction (AHJ).
6. Inspector (if any): Copy of "Approved" or "Approved as Noted" submittals.
7. Testing and Inspection Agencies: Copy of "Approved" or "Approved as Noted" submittals required for them to perform inspections and testing.

I. Contractor shall not be relieved from responsibility for coordination with other submittals or for errors or omissions in submittals by Architect's approval thereof.

J. Material lists and quantity information included in submittals are sole responsibility of Contractor.

K. Where a submittal is required by Specifications, any related Work performed prior to Architect's review and approval of the pertinent submission will be sole expense and responsibility of Contractor.

1.12 ARCHITECT ACTION ON SUBMITTALS

A. Architect's action on submittals:

1. "APPROVED": Submittal is in general conformance with the design concept of Project and in general compliance with information given in Contract Documents.
2. "APPROVED AS NOTED": Submittal has minor issues. Noted corrections must be made in final installation. Architect has option to require re-submission for record.
3. "REVISE AND RESUBMIT": Re-submission is required, due to nature or number of issues.
4. "NOT APPROVED": Submittal does not meet contract requirements or is not required to be submitted.
5. "NO ACTION REQUIRED": Submittal not required, Project Information or Contract Closeout Information Submittal.

B. Architect will review and approve or take other appropriate action upon Contractor's submittals, but only for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

1. Such review and action is limited to only those submittals identified in Contract Documents.
2. Architect's review of such submittals is not conducted for purpose of determining accuracy and completeness of other details and information such as dimensions, quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of the Contractor.
3. Architect's review or approval of a specific item shall not indicate approval of an assembly of which the item is a component.
4. Architect's review or approval shall not constitute a review of safety or health precautions, or of any construction means, methods, techniques, sequences or procedures.
5. Architect's review or approval on a resubmission shall not apply to revisions that Contractor has not directed specific attention to in writing on resubmitted submittals, other than those requested by Architect on previous submittal.

C. Architect's action will be taken with such reasonable promptness as to cause no delay in Work or in activities of Owner, Contractor or separate contractors, while allowing sufficient time in Architect's professional judgment to permit adequate review by Architect, Architect's consultants, and Owner, if needed.

1. Architect's obligation to review or approve submittals and to return them with reasonable promptness is conditional upon prior review and approval of submittals by Contractor, and Contractor's transmittal of submittals in accordance with Contract Documents and approved Schedule of Submittals.

D. Items not submitted in accordance with provisions of this section may be returned, without review or action.

1. Submittals which do not indicate Contractor has reviewed submittal for compliance with Contract Documents, and approved submittal.
2. Submittals which are not required by Contract Documents.
3. Submittal on items not approved for use by Contract Documents.
4. Submittals which include information from more than one specification section.
5. Project Information Submittals or Contract Closeout Information Submittals included with other submittals required by specification section Submittal paragraph.

6. Submittals required by other contractors or trades for their coordination that are not required by specification section Submittal paragraph.
7. Submittal of products, systems, or manufactures not specified.
8. Submittal of substitution.
9. Submittal of MSDS information.
10. Information on only a portion of a submittal.
11. If approved Submittal Transmittal form was not used.

E. If a submittal must be delayed for coordination with other submittals not yet submitted, Architect may, as an option, either return submittal with no action or notify Contractor of other submittals which must be received before submittal will be reviewed.

F. Additional copies of submittals not required or requested may not be returned.

G. Architect may review Project Information Submittals or Contract Closeout Information Submittals at its sole discretion, for general compliance with design concept expressed in Contract Documents.

H. Architect will return submittal utilizing Newforma Info Exchange indicating comments and action taken for Contractor's use and distribution.

1. Architect will notify Contractor by email when submittals have been reviewed and posted to Newforma.
2. Architect is not required to return Samples, Project Information and Contract Closeout Information submittals.
3. Submittals may be returned by regular mail at Architect's discretion.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SUBMITTAL TRANSMITTAL

PROJECT: _____

SUBMITTAL NO: _____ _____ _____
_____ _____ _____
_____ _____ _____

SECTION NUMBER: ----------| | |
SEQUENCE NUMBER: ----------| |
RE-SUBMITTAL CHARACTER: ----------|

ARCH PROJ. NO.: _____
SPECIFICATION TITLE: _____
MANUFACTURER: _____

- Do not submit on manufacturers not listed in Specifications.
- Architect's Action Taken in accordance with provisions of the Contract Documents.
- This Transmittal Form shall stay with the submittal throughout routing. Copy for file.

DESCRIPTION OF SUBMITTED ITEM: _____

Routing Sequence	Action Taken By	Date Rec'd	Date Sent	Number Copies	Action Taken
Subcontractor/Supplier: CONTRACTOR / SUPPLIER					A Note 1
Contractor: CONSTRUCTION MANAGER					A Note 1
Architect: HDR Inc.					
Contractor: CONSTRUCTION MANAGER					
Subcontractor/Supplier:			N.A.		
Owner:	N.A.		N.A.		N.A.

ACTION LEGEND

Indicated in Action Taken column above.

A APPROVED
B APPROVED AS NOTED
C REVISE AND RESUBMIT
D NOT APPROVED
E1 NO ACTION REQUIRED - Informational
E2 NO ACTION REQUIRED - Informational with Comments
E3 NO ACTION REQUIRED - Submittal not required

Note 1: Submittal transmittal to Architect indicates Contractor and subcontractor have reviewed for compliance with Contract Documents and have approved submittal.

COMMENTS

❑ SEE ATTACHED COMMENTS ❑ SEE ENCLOSED SUBMITTAL FOR COMMENTS
❑ SUPPLEMENTAL INFORMATION REQUIRED

_____
_____
_____
_____

END OF SUBMITTAL TRANSMITTAL

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SECTION 01 35 73
DELEGATED DESIGN PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General provisions for delegated design services.
2. Coordination of delegated designs with other Work.
3. Qualifications requirements for delegated design professionals.
4. Limitations on Engineer's review of delegated design Submittals.
5. Responsibilities of delegated design professionals.

B. Scope:

1. Where delegated design is specifically Contractor's responsibility in accordance with the Contract Documents, Contractor shall provide labor, services, other effort, and pay all costs necessary and required to perform delegated design services for Work that will be part of the completed Project as a functioning whole.
2. Perform delegated design Work in accordance with the Contract Documents, delegated design Action Submittals approved by Engineer, and Shop Drawings, product data Submittals, and Samples approved by the associated delegated design professional.
3. Contractor's correction period, general warranty and guarantee, and obligations for safety and protection apply to delegated design Work to the same extent such provisions apply to all other Work under the Contract.
4. Specifications requiring delegated design services include, but are not necessarily limited to, the following:
    a. Section 05 50 00 - Metal Fabrications.
    b. Section 13 34 19 - Metal Building Systems.
5. Not Delegated Design: The following are not delegated design and are not covered by this Section:
    a. Certain final designs that, in accordance with commonly accepted practice, are typically prepared by unlicensed, unregistered individuals, including for manufactured or fabricated systems, components or assemblies, not acting under the supervisory control of the design professional in responsible charge, but who commonly possess appropriate certification from a relevant industry organization, together with appropriate training and experience.

C. Related Requirements:

1. Sections of Divisions 02-49 where delegated design Work is required.

1.2 REFERENCES

A. Terminology:

1. Terminology indicated below are not defined terms and are not indicated with initial capital letters but, when used in this Section and Specifications of Division 02-49 where delegated design Work is required, have the meaning indicated below:
    a. "Delegated design" means preparing the final design of part of the completed, permanent Work by one or more delegated design professionals, in accordance with the Contract Documents. The terms "delegated design", "delegated design services", "delegation of design responsibility", and similar or derivative terms have the same meaning.
    b. "Delegated design professional" means the licensed and registered engineer, architect, geologist, or other design professional retained by or employed by Contractor,

Subcontractor, or Supplier to perform delegated design services for delegated design Work and possessing appropriate experience and qualifications for such delegated design services.

c. “Delegated design Work” means delegated design services, associated construction, and related Work.

d. “Instruments of service”, relative to delegated designs, means delegated design professional’s: (1) certifications (including delegated design professional’s certification of compliance, as required in this Section, and other certifications required of delegated design professional), (2) reports (where required), (3) design drawings, (4) design specifications, (5) other documents specifically indicated as delegated design professional’s “instruments of service” in the Contract Documents, and (6) documents modifying a delegated design (after Engineer’s approval of the original delegated design Submittals). “Instruments of service” are to be sealed, signed, and dated by delegated design professional and expressly required as Submittals. Shop Drawings sealed and signed by delegated design professional are delegated design professional’s “instruments of service”.

1.3 GENERAL PROVISIONS CONCERNING DELEGATED DESIGN SERVICES

A. Delegated Designs - General:

1. This Section augments the requirements of the General Conditions, as may be amended by the Supplementary Conditions, and other provisions of the Contract Documents regarding Contractor’s responsibilities for delegated design Work.
2. Delegated design professionals or their employer shall furnish professional liability insurance. Provisions on professional liability insurance are set forth in the Supplementary Conditions. Submit through Contractor appropriate documentation of professional liability insurance.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordination - General:
   a. Contractor shall coordinate the services of delegated design professionals with all other elements of the Work.
   b. Contractor has full responsibility for scheduling delegated designs and all related Work.
   c. Allow sufficient time in Progress Schedule for performance of delegated design services, including requests for interpretation or clarification between delegated design professional and Contractor and between Contractor and Engineer.
2. Coordination of Delegated Design Work’s Connections to Other Work:
   a. Where delegated design Work connects to other Work designed by Engineer, existing construction, or both, the delegated design Work shall be consistent with the other Work and existing construction to which delegated design Work connects, and adjacent construction.
   b. Submit details, loading, anchorage, and other coordinating information necessary for the delegated design Work to properly interface with Work designed by Engineer.
   c. Changes in the Work, whether designed by Engineer, designed by delegated design professional, or existing construction, necessary as a result of the delegated design are ineligible for increase in Contract Price or Contract Times, unless: (1) otherwise agreed by both Engineer and Owner, or (2) expressly indicated otherwise elsewhere in the Contract Documents for the associated delegated design Work.
   d. Changes requiring extra compensation, time, or both arising from delegated design aspects needed for convenience of Contractor, Subcontractor, or Supplier, are not grounds for increase in Contract Price or Contract Times.
3. Coordination of Submittals, Fabrication, Production, and Shipment:

a. Do not release for raw materials procurement, fabrication, production, and shipment to the Site materials, equipment, or systems designed by delegated design professional until the associated delegated design professional has reviewed and approved all associated Shop Drawings, product data, Samples, and (relative to shipment) source quality control Submittals, and such Submittals have been delivered to and accepted by Engineer.
    1) For delegated design systems that required reactions to be submitted to the Engineer. These submittals shall be submitted and approved first before approval is given for the delegated design submittal.
b. Allow sufficient time in the Progress Schedule for required Submittals and required actions by delegated design professionals and Engineer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Delegated Design Professionals:
    a. Each delegated design professional shall possess not less than the minimum qualifications set forth in this provision. Where the Specifications for the associated delegated design Work establish more-stringent qualifications requirements, comply with the more-stringent requirements.
    b. Each delegated design professional shall comply with all of the following:
        1) Legally qualified, as both an individual and as a business entity, to practice the associated design discipline(s) in the jurisdiction where the Site is located, including possessing current, valid license and registration for the design discipline(s) for which the delegated design professional will render its services on the Project.
        2) Possess not less than five years of experience in the subject design discipline(s).
        3) Served as design professional in responsible charge on not less than five other designs similar in scope and complexity to the Work for which delegated design professional is retained on the Project; construction of such prior projects shall be complete by the start of the Project's construction.
    c. Summary of Qualifications: Submit to Engineer summary of delegated design professional's experience and qualifications, including:
        1) Evidence of coverage under appropriate professional liability insurance in accordance with the Contract Documents.
        2) Evidence of delegated design professional's ability to legally conduct business as a design professional in the same jurisdiction as the Site, as a business entity.
        3) Copy of delegated design professional's current, valid personal design professional license and registration for the same jurisdiction as the Site. Such documents shall indicate the individual's name, license or registration number, and dates for which the license or registration is valid.
        4) Other information reasonably requested by Engineer.

1.6 GENERAL PROVISIONS FOR DELEGATED DESIGN SUBMITTALS

A. Under the Division 02-49 Specifications section(s) where delegated design Work is required, furnish to Engineer Submittals such as:

1. Action Submittals:
    a. Delegated design professional's instruments of service Submittals.
2. Informational Submittals:
    a. When delivered to Engineer, the following must bear delegated design professional's Submittal approval stamp:
        1) Shop Drawings, product data Submittals, Samples, testing plans.
        2) Results of source quality control and field quality control activities.
    b. Delegated design professional's calculations.

c. Other Informational Submittals required for the subject delegated design Work.

B. Limitations of Engineer's Review of Delegated Design Submittals:

1. Delegated Design Professional's Instruments of Service Submittals:
   a. Engineer's review of delegated design instruments of service Submittals is for the limited purposes indicated in this Section's "General Provisions Concerning Delegated Designs" Article.
   b. The following disclaimer applies to Engineer's responses to delegated design professional's instruments of service Submittals:
      1) Engineer's review and approval of delegated design instruments of service is only for the limited purpose of verifying that performance and design criteria given in the Contract were used in the delegated design, and checking for compliance with the Engineer's design concept expressed in the Contract Documents.
      2) Contractor is solely responsible for complying with: the Contract Documents, Subcontractor and Supplier instructions consistent with the Contract Documents, Owner's directions, and Laws and Regulations.
      3) Contractor is solely responsible for obtaining, correlating, confirming, and correcting dimensions at the Site; quantities; information and choices pertaining to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the Work of all trades.
      4) Engineer is not responsible for the effects of resubmittals or tracking progress of resubmittals.
2. Delegated Design Informational Submittals:
   a. Other provisions of the Contract Documents notwithstanding, Engineer's review of delegated design Informational Submittals is limited to only:
      1) Verifying the Submittal was furnished as required; and
      2) Submittal generally appears complete (except for calculations); and
      3) Submittal bears delegated design professional's approval stamp; or, for calculations prepared by or for delegated design professional, that such calculations bear delegated design professional's seal, signature, and date; or, for delegated design professional's reports of visits to the Site, that such report is legible, and bears delegated design professional's signature with date.
   b. Engineer receives such Submittals, including delegated design professional's calculations, on behalf of Owner, for Owner's records.
   c. Engineer, Owner, and others involved in the Project have the right to rely on delegated design professional's approval stamp as meaning that the delegated design professional has performed and appropriate review of the Submittal and determined it to be complete, in accordance with delegated design professional's instruments of service approved by Engineer, in accordance with delegated design professional's design intent, and in accordance with the Contract Documents.
3. Engineer's Other Comments on Delegated Design Submittals:
   a. Despite the limitations of Engineer's review of Submittals for delegated design Work, should Engineer become aware of, or reasonably suspect existence of, potential of associated delegated design Work to adversely affect health, safety, or welfare of persons, or pose reasonable potential for damage to the Work, work of other contractors, or adjacent property, Engineer will advise Contractor in writing of general nature of Engineer's concern.
   b. Such advisory by Engineer, if issued, is rendered in good faith and does not in any way constitute:
      1) Engineer's review of all aspects of the delegated design.
      2) Any sharing by Engineer of any of delegated design professional's responsibilities or professional liability.

3) Any responsibility imposed, in any way, on Engineer for any aspect of the delegated design professional's services or design, beyond the limited purposes of Engineer's review as set forth in the Contract Documents. .

c. Contractor and its Subcontractors and Suppliers, including delegated design professionals, shall immediately investigate Engineer's concern indicated in such advisory and remedy as necessary and required.

d. Neither Engineer nor Owner, nor their respective consultants and subcontractors, is obligated to review any Submittal for delegated design Work beyond the limited review required by the Contract Documents. No such advisory, if issued, entitles Contractor, Subcontractor, or Supplier, including delegated design professionals, to rely on such advisory or to assume that any further such reviews or written or oral advisories are forthcoming.

1.7 RESPONSIBILITIES OF DELEGATED DESIGN PROFESSIONALS

A. Standard of Care:

1. Unless a higher standard of care is established by the Division 02-49 Specifications section where the associated delegated design Work is required, the delegated design services shall comply with the following standard of care:

a. Except as provided in the paragraph immediately above this, the standard of care for all delegated design professional services and related services performed or furnished by delegated design professionals for the Project will be the care and skill ordinarily used by members of the subject profession practicing under similar circumstances at the same time and in the same locality.

B. Responsibilities of delegated design professionals employed on the Work include, but are not necessarily limited to, the following, unless specifically indicated otherwise in the associated elements of the Contract Documents where the delegated design is required:

1. Ethical Conduct and Professionalism: Comply with Laws and Regulations and applicable standards and guidelines relevant design professional organizations for ethical conduct and professional practice.
2. Comply with Laws and Regulations and relevant design standards applicable to the subject delegated design Work.
3. Performance and Design Criteria Indicated in the Contract Documents and Other Information:

a. Review performance and design criteria, indicated in the Contract Documents, that the delegated design Work must satisfy.

b. Prepare written requests for interpretations or clarifications of performance or design criteria.

c. Review existing information about the Site that constitutes Technical Data (if any, applicable to the subject delegated design Work), as indicated in the Supplementary Conditions.

4. Site Information and Investigations: With Contractor, obtaining all other necessary dimensions, field information, and other information necessary for preparing delegated design Submittals.
5. Design and Other Professional Services: Personally perform and prepare, or actively exercise direct, personal, supervisory control over others performing or preparing:

a. Necessary design professional evaluations of conditions, materials, and equipment.

b. Prepare the instruments of service Submittals and calculations Submittal for the subject delegated design Work, where required by the associated Division 02-49 Specifications and other, associated Contract Documents.

c. Assist Contractor with applying for and obtaining permits and approvals (not previously obtained by Owner or those for whom Owner is responsible) necessary for the delegated design Work.

d. Review and approve or take other appropriate action on Shop Drawings (unless such Shop Drawings are sealed and signed by delegated design professional), product data, Samples, and testing plans, and other Submittals associated with the delegated design Work.

e. Prepare modifications of the delegated design instruments of service as necessary.

6. Sealing and Signing:

   a. Seal, sign, and indicate date of sealing and signing, on all of the following when such Submittals are required by the Division 02-49 Specifications where the delegated design Work is required:

      1) Instruments of service Submittals, including certification of compliance required.

      2) Calculations.

      3) Modifications to the delegated design.

      4) Other documents required to be sealed and signed by Laws or Regulations or the Contract Documents.

   b. Sealing and signing documents in accordance with Laws and Regulations and the Contract Documents, prior to submittal (through Contractor) to Engineer, and for submittal to authorities having jurisdiction to obtain necessary permits and approvals.

   c. Sealing and signing shall be in accordance with Laws and Regulations.

7. Certification of Compliance by Delegated Design Professional:

   a. Schedule:

      1) Submit certification of compliance after Engineer's acceptance of delegated design professional's qualifications statement.

      2) Obtain Engineer's approval of certificate of compliance Submittal prior to furnishing other Submittals for delegated design Work under the same Specifications section, unless otherwise allowed by Engineer.

   b. Through Contractor, submit to Engineer, delegated design professional's written certification indicating:

      1) General Information: (1) Project name and designation, (2) Contractor name and Contract designation, (3) Subcontractor or Supplier name (when applicable), (4) full name of delegated design professional's business entity under which the delegated design services were performed, (5) full name and license number of the individual sealing and signing the subject delegated design Work, (6) specific elements of delegated design Work to which the certification applies, and (7) delegated design professional's seal, signature, and date of signature.

   c. Explicit certification that the subject delegated design complies with:

      1) All applicable performance and design criteria indicated in the Contract Documents. Expressly indicate on certification of compliance the specific performance and design criteria used in the delegated design, and reaction forces of the delegated design imparted to other Work and existing construction. Reaction forces imparted from the delegated design elements to the Engineer's designed system shall include the following:

         a) Reaction forces imparted from the delegated design elements to the Engineer's designed system shall be presented as follows:

            (1) Unfactored loads per category (dead, live, wind, seismic, etc.).

            (2) Load combinations presented in Load Factor Resistance Design (LRFD) format from each element transmitting load.

         b) All Laws and Regulations.

         c) Applicable design standards commonly applicable to such types of construction. Expressly indicate such design standards on the certification of compliance.

         d) The applicable standard of care. Expressly indicate the applicable standard of care.

8. Approvals of Other Delegated Design Submittals:
    a. Review and taking appropriate action on Submittals for delegated designs:
    b. Such reviews and approvals or other appropriate action shall be to ascertain compliance with:
        1) Delegated design professional's design intent.
        2) Delegated design professional's instruments of service and calculations.
        3) Associated requirements of the Contract Documents.
    c. Delegated design professional's review stamp or facsimile thereof, review action or disposition concerning the associated Submittal for the delegated design, date of review, and name of person performing the review shall be clearly legible on the associated Submittals (except for delegated design professional's own instruments of service Submittals, calculations, and reports of delegated design professional's visits to the Site). Prominently display delegated design professional's Submittal review stamp or facsimile thereof on: (1) each sheet of Shop Drawings, (2) each major section of product data Submittals, (3) each Sample, (4) each testing plan, and (5) each other Submittal associated with the delegated design for which such review stamp is required.
    d. Do not apply delegated design professional's Submittal review stamp and comments, if any, over other text, tables, or graphics.
    e. Where review stamp or facsimile thereof is required, submit to Engineer only those Submittals for delegated design Work that bear delegated design professional's explicit approval of the Submittal.
9. Respond promptly to requests for interpretation or clarification on delegated design professional's instruments of service and other Submittals for the delegated design Work.
10. Progress and Quality of Construction of Delegated Design Work:
    a. Where appropriate for the subject delegated design Work, periodically visit the Site at appropriate intervals to observe the progress and quality of the subject delegated design Work.
    b. Where delegated design professional does not visit the Site during construction, keep informed of the progress and quality of the subject delegated design Work via discussions with Contractor, Subcontractor, and Suppliers, via photographic documentation, and other means acceptable to delegated design professional.
    c. Advise Contractor in writing when the subject delegated design Work is not in accordance with the delegated design professional's instruments of service (approved by Engineer) and related Submittals approved by delegated design professional.
    d. Furnish to entity that retained delegated design professional copy of delegated design professional's written report of each visit to the Site.
11. Modifications to Design:
    a. Design appropriate modifications to the delegated design Work, including preparing new or revised certifications, reports, design drawings, sketches, design specifications, and calculations, as appropriate.
    b. Such instruments of service and calculations shall be submitted to Engineer through Contractor to same extent original instruments of service Submittals and calculations, if any, where required by the Contract Documents for the subject delegated design Work.
12. Other services, as mutually agreed upon by delegated design professional and its client, or as required elsewhere in the Contract Documents.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes definitions, terminology, abbreviations, and acronyms commonly used in Contract Documents.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Architect, Engineer, or Architect/Engineer:

1. Each of these terms mean HDR Architecture, Inc., or an affiliate as otherwise provided in Contract Documents, or duly authorized representatives, such representatives acting severally within scope of particular duties entrusted to them, unless otherwise provided in Contract Documents.

C. “Base” and “Optional”: Refer to Section 01 61 00 – Common Product Requirements.

D. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

L. "Contract Limit": Space available for performing construction activities; the primary area of Work may be indicated by a Limit of Construction line on Drawings but Work necessary to complete the Project can also occur beyond this limit. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

M. "Remove": Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

N. "Remove and Salvage": Detach items from existing construction and deliver them to Owner."Salvage": Carefully detach from existing construction, in a manner to prevent

damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

O. "Remove and Reinstall": Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

P. "Existing to Remain": Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

Q. "Demolish": Tearing down, destruction, breakup, razing or removal of the whole or part of a building or structure, or a free standing machinery or equipment that is directly related to the function of the structure.

R. "Recycle": Recovery of demolition waste for subsequent processing in preparation for reuse.

S. Permanent Enclosure: As determined by Architect, the condition at which roofing is insulated and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures equivalent in weather protection to permanent construction.

1.3 ABBREVIATIONS - TERMINOLOGY

A. Where abbreviations and acronyms are used in Specifications as terminology, they shall mean as defined in the following list. If not listed herein, they shall mean as listed and defined in ASME Y14.38 “Abbreviations and Acronyms for Use on Drawings and Related Documents.”

$	dollars
1P	one pole
1S	single speed
1W	one winding
2P	double pole
2S	Two-speed
2W	two winding
A	compressed air
am	ante meridian
A/C	air conditioner
A/E	Architect/Engineer
AB	anchor bolt, air barrier, air blender, auger boring
ABA	Architectural Barriers Act
AC	air compressor, alternating current
ACB	air circuit breaker
ACC	accessible (ADA)
ACH	air changes per hour
ACIP	architectural cast in place concrete
ACLD	air cooled
ACM	asbestos-containing material
ACM	Aluminum Composite Material
ACSR	aluminum conduit or steel reinforced
ACU	air conditioning unit
ACV	air control valve
AD	area drain, automatic damper
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ADJ	adjust, adjustable
AF	air filter, amps frame
AFD	adjustable frequency drive
AFF	above finished floor
AFG	above finished grade
AFH	air filter housing
AFM	air flow meter
AGGR	aggregate
AHU	air handling unit
AIC	ampere interrupting capacity
ALT	alternate
AL	aluminum
ALUM	aluminum
AM	amplitude modulation, ammeter
AMB	ambient
AMP	amplifier
ANCT	acid neutralization tank

ANN	annunciator
ANOD	anodized
ANS	automatic answer and recall switch
ANT	antenna
APC	architectural precast concrete
APD	air pressure drop
ARCH	architectural
ARR	arrester
ASPH	asphalt
AT	autotransformer
ATM	atmosphere
ATS	automatic transfer switch
ATU	air terminal unit
AUTO	automatic
AUX	auxiliary
AV	acid vent
avg	average
AW	acid waste
B	boiler, bottom
B & B	balled and burlapped
B & BB	breakers and bus bracing
B to B	back to back
BARO	barometer
BAS	building automation system
BB	boiler burner, broad band
BBD	boiler blowdown, broad band data
BCCMP	bituminous coated corrugated metal pipe
BDD	backdraft damper
BDF	building distribution frame
BF	boiler feed
BFP	backflow preventer
BFS	boiler feed system
BHC	booster heating coil
Bhp or BHP	brake horsepower
BIM	building information model
BKR	breaker
BKT	bracket
BL	bed locator, baseline
BLDG	building
BM	beam
BOD	biochemical oxygen demand
BOD_5	five-day biochemical oxygen demand
BOF	bottom of footing
BOT	bottom
BP	base plate
BR	bare root, bottom register, bullet resistive
BRG	bearing
BRZ	bronze
BS	barium sink
BSMT	basement
BUR	built-up roof
BWR	brine water return
BWS	brine water supply
C	conduit
C	Celsius (or Centigrade)
C & G	curb and gutter
C TO C	center to center
CA	cold air, cardiac arrest
CADD, or CAD	computer-aided drafting and design
CALL	incoming call
CANT	cantilever
CAP	capacity
CATV	community antenna television
CB	chalkboard, circuit breaker, catch basin
CBOD	carbonaceous biochemical oxygen demand
$CBOD_5$	five-day carbonaceous biochemical oxygen demand
CC	cooling coil
CCTV	closed circuit television
CCW	counterclockwise
CD	ceiling diffuser, condensate drain, coiling door
CFC	chlorofluorocarbons
CFCI	contractor furnished, contractor installed
CFR	Code of Federal Regulations
CFS	cubic feet per second
CG	container grown, corner guard, coiling grille
CG	center of gravity
CGU	ceramic glazed units
CH	chiller
CHW	chilled drinking water

CI	cast iron
CIP	cast iron pipe, cast in place
CIR	circulating
CJ	construction joint, control joint
CJP	complete joint penetration
CKS	control key switch
CKT	circuit
CL	center line
CLG	ceiling, cooling
CLPR	clean low pressure steam return
CLPS	clean low pressure steam supply
CLR	clear
CM	Construction Manager
CMP	corrugated metal pipe
CMPA	corrugated metal pipe arch
CMPR	compressor, clean medium pressure steam return
CMPS	clean medium pressure steam supply
CMU	concrete masonry unit
CO	cleanout, carbon monoxide
CO2	carbon dioxide
COD	chemical oxygen demand
COL	column
CONC	concrete
COND	condition, condenser, condensing,
COND	condensation
CONN	connection
CONST	construction
CONT	continuous
CONTR	contractor
CONV	converter
CORR	corridor
CP	concrete pipe (non-reinforced),
CPD	condensate pump discharge
CPR	change proposal request
CPU	central processor unit
CPVC	chlorinated polyvinyl chloride
CR	control room, ceiling register, crash rail
CRCS	clean room ceiling system
CRF	condensation resistance factor
CRIT	critical
CRPS	clean room partition system
CS	counter shutter
CSI	current source inverters
CSMU	calcium silicate masonry unit
CSS	clinical service sink
CT	cooling tower, current transformer, computer terminal
CTR	center, cooling tower return
CTR	controlled time run
CTS	cooling tower supply
CU	condensing unit, copper
CUH	cabinet unit heater
CULV	culvert
CW	cold water, clockwise
CWR	chilled water return
CWS	chilled water supply
D	delta, depth
DB	dry bulb, decibel, direct bury
DBA	deformed bar anchor
DBL	double
DBT	dry bulb temperature
DC	direct current
DC	direct current
DD	diversion dike
DDC	direct digital control
DEMO	demolition, demolish
DET	detail
DF	drinking fountain
DIA	diameter
DIC	difference in conditions contract
DIFF	difference
DIM	dimension
DIP	ductile iron pipe
DISP	dispenser
DIST	distribution, distilled
DIW	deionized water
DIWI	double-inlet, double-width
DL	dead load
DLO	daylight opening
DMPR	damper
DN	down
DO	ditto
DP	data processing, differential pressure,
DP	dew point

DPA	damper position adjustment
DPAN	distribution panel
DPS	door position switch
DR	drain
DS	downspout
DT	dew point temperature
DTS	data transmission system
DWG	drawing
DWH	domestic water heater
DWL	dowel
DWV	drain, waste and vent
DX	direct expansion
E SCAN	emergency medical status scan switch
EA	exhaust air, expansion anchor, each
EAH	exhaust hood
EAT	entering air temperature
EE	electrical engineer
EEG	electro encephalograph
EF	exhaust fan, each face
EFF	efficiency
EFT	electric finned tube
EGR	ethylene glycol return
EGS	ethylene glycol supply
EH	electric heater
EIFS	exterior insulation finish system
EJ	expansion joint
EJC	expansion joint cover
EKG	electro cardiograph
EL	elevation
ELEC	electrical
EM	electro-magnetic
EMB	embedment
EMER	emergency
EMI	electro-magnetic interference
EMS	energy management system
EMT	electrical metallic tubing
ENG	engine
ENGR	Engineer
EO	exit only, electrically operated
EPDM	Ethylene Propylene Diene Monomer
EPR	ethylene propylene rubber
EPT	electric power transfer
EQ	equal
EQUIP	equipment
ER	emergency room, exhaust register
ES	emergency shower
EST	estimate
ET	expansion tank
EV	evaporator
EVT	equiviscous temperature
EW	each way
EWC	electric water cooler
EWT	entering water temperature
EXC	excavate
EXH	exhaust
EXIST	existing
EXP	expansion, exposed
EXT	exterior
F	filter
F TO F	face to face
FA	fire alarm, face area
FC	foot control
FCAN	full capacity above nominal
FCBN	full capacity below nominal
FCO	floor clean out
FCS	fire command station
FCU	fan coil unit
FD	fire damper, floor drain
FDN	foundation
FDV	fire department valve
FE	fire extinguisher, finished end
FEC	fire extinguisher cabinet
FF	final filter
FH	fire hose
FHC	fire hose cabinet
FHV	fire hose valve
fig	figure
FIN	finished
FL	floor
FLA	full load amps
FLG	flange
FLUOR	fluorescent
FM	frequency modulation
FO	fiber optic
FOBB	fiber optic backbone

FOCC	fiber optic cross connect
FODC	fiber optic distribution cabinet
FOF	fuel oil fill
FOR	fuel oil return
FOS	fuel oil supply
FOSE	fiber optic service entrance
FOV	fuel oil vent
FP	full penetration
FR	fire retardant
FRP	fiberglass reinforced plastic
FS	floor sink
FSD	flexible strip door
FSK	foil scrim kraft
FT	finned tube
FTG	footing
FU	furnace unit
FURN	furnish
FUT	future
FV	field verify, face velocity
FVC	fire valve cabinet
FW	flammable waste
FXTR	fixture
G	gas, ground, grille
GA	gauge, gage
GALV	galvanize(d)
GC	high build glazed coating, general contractor
GCWR	glycol chilled water return
GCWS	glycol chilled water supply
GEN	generator
GF	granular fill
GFCI	ground fault circuit interrupter
GFI	ground fault interrupter
GFP	ground fault protection
GFRC	glass fiber reinforced cement
GFRG	glass fiber reinforced gypsum
GI	galvanized iron
GL	glass
GR	grade
GUM	glass unit masonry
GWB	gypsum wallboard
GWR	glycol water return
GWS	glycol water supply
GYP	gypsum
H	humidifier, height
H2O	water
HA	hot air
HB	hose bibb, horizontal blinds
HBC	high build glazed coating
HC	heating coil
HCWR	hot chilled water return
HCWS	hot chilled water supply
HD	heavy duty
HDG	hot dip galvanized
HDPE	high density polyethylene
HDWD	hardwood
HE	helium
HECMP	horizontal elliptical corrugated metal pipe
Hg	mercury
HID	high intensity discharge
HK	hook
HM	hollow metal
HMI	human-machine interface
HORIZ	horizontal
HOSP	hospital grade
HP	heat pump, high point
HPR	high pressure steam return
HPS	high pressure sodium, high pressure steam supply
HR	handrail, hour
HS	headed studs
HSB	high strength bolt
H-STAT	humidistat
HT	heat
HTG	heating
HTR	heater
HV	high voltage
HVAC	heating, ventilating and air conditioning
HW	hardware group, hot water
HWC	hot water circulating
HWR	hot water return
HWS	hot water supply
HX	heat exchanger
I/O	input/output
IAQ	indoor air quality

IC	intercom
ICW	industrial cold water
ID	inside diameter
ID	inside diameter
IG	isolated ground
IH	intake head
IHW	industrial hot water
IMC	intermediate metal conduit
INCAND	incandescent
INFO	information
INSUL	insulation
INT	interior
IPS	iron pipe size
IPS	iron pipe size
IU	induction unit
IV	intravenous
IVT	intravenous track
IWR	ice water return
IWS	ice water supply
JC	Janitor’s closet
JT	joint
KO	knockout
KT	keyboard tray
L	length, lavatory, lock
LA	lightning arrester
LAHP	laboratory air (high pressure)
LALP	laboratory air (low pressure)
LAT	leaving air temperature
LAV	lavatory
LC	lead covered
LCD	liquid crystal display
LCW	laboratory cold water
LD	linear diffuser, laboratory drain
LDW	less door width
LED	light emitting diode
LEED	Leadership in Energy and Environmental Design (USGBC)
LHWC	laboratory hot water circulating
LIM	line isolation monitor
LIN	linear, lineal
LF	linear foot
LL	live load, lead lined
LLH	long leg horizontal
LLV	long leg vertical
LN	liquid nitrogen
LONG	longitudinal
LP	low point
LPR	low pressure steam return
LPS	low pressure steam supply
LR	linear return
LRA	locked rotor amps
LS	life safety, life support
LSH	long slotted holes
LSS	lock status switch
LT	light
LTGWR	low temperature glycol water return
LTGWS	low temperature glycol water supply
LV	low voltage
LVT	laboratory vent pipe
LVTR	laboratory vent through roof
LW	lightweight, laboratory waste
LWIC	lightweight insulating concrete
LWT	leaving water temperature
MA	mixed air, make-up air
MAS	masonry
MATL	material
MATV	master antenna television
MAU	make-up air unit
MAX	maximum
MB	main breaker, markerboard
MCB	main circuit breaker
MCC	motor control center
MCP	motor circuit protector
MD	manual damper, motion detector
MECH	mechanical
MED	medicine, medical
MEK	methyl ethyl ketone
MERC	mercury
MET	metal
MEZZ	mezzanine
MFR	manufacturer
MGA	medical gas alarm
MH	manhole, metal halide
MIN	minimum, minutes
MISC	miscellaneous
MLO	main lugs only

MO	masonry opening, motor operated
MOD	modified
MP	medium pressure
MPR	medium pressure steam return
MPS	medium pressure steam supply
MS	mop sink, motion sensor
MTL	metal, material
MTP	metal toilet partition
N2	nitrogen
NA	not applicable
NAT	natural
NBD	narrow band data
NBDC	narrow band data cabinet
NC	nurse call, normally closed, non-corrosive
ND	normal duty
NDC	nose down curb
NDT	non-destructive testing
NEG	negative
NET	nylon entrance tile
NI	nickel
NIC	not in contract
NO	number, normally open, nitrous oxide
no. or #.	number
NOM	nominal
NOx	nitrogen oxide (total concentration of mono-nitrogen oxides)
NP	non-plenum
NPO	non-plenum office
NPS	nominal pipe size
NPSH	net positive suction head
NPSHA	net positive suction head available
NPSHR	net positive suction head required
NPT	nominal pipe thread
NPT	national pipe threads
NR	noise reduction
NRC	noise reduction coefficient
NTS	not to scale
NWT	normal weight
O2	oxygen
OA	outside air
OC	on center, overcurrent
OCB	oil circuit breaker
OD	outside diameter, overflow roof drain
OD	outside diameter
OF	overflow
OFCI	owner furnished, contractor installed
OFOI	owner furnished, owner installed
OH	overhead
OIT	operator interface terminal
OPNG	opening
OPP	opposite
OPT	operator’s terminal
OSD	open site drain
OSL	outstanding leg
P	pump, plenum
P SCAN	Personal attention medical status scan
p.m.	post meridian
PA	public address
PB	push button, pull box, power brick
PBX	private board exchange
PC	plug connector, Portland cement
PCB	polychlorinated biphenyl
PCC	Portland cement concrete
PCG	polycarbonate corner guard
PCS	process control system
PCWR	process cooling water return
PCWS	process cooling water supply
PD	pressure drop, pressure drainpipe
PE	Polyethylene
PERF	perforated
PERM	permanent
PF	prefilter, power factor
PFCC	power factor correction capacitor
PFF	provision for future feeder
PH	phase
PH/0	phase
PHC	preheat coil
PI	passive infrared
PID	proportional-integral-derivative
PIV	post indicator valve
PL	property line, plate, pilot light
PLBG	plumbing
PLC	programmable logic controller
PLNJ	paper and lead neoprene jacket

PLS	pure live seed
PNL	Panel
POL	polished
PP	partial penetration, pump plumbing
PPB	parts per billion
PPCF	patch panel connection field
PPH	parts per hundred
PPM	parts per million
PR	pair
PRL	parallel
PROJ	project, projection
PROP	property
PROT	protective, protection
PRV	pressure reducing valve, pressure relief valve
PS	plaster sink, presence sensor, pull switch
PT	printer, pneumatic tube, potential transformers
PTAC	packaged terminal air conditioner
PTS	pneumatic tube station
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride
PVF	polyvinyl fluoride
PVMT	pavement
PVS	polyvinyl spiral (pipe)
PW	purified water
PWC	purified water circulating
PWD	plywood
PWM	pulse width modulated
R	radius, rankine, riser, rubber sheath, register
R/W	right-of-way
RA	return air
RAD	radiology
RCCP	reinforced concrete culvert pipe
RCF	riser connection field
RCP	reinforced concrete pipe, reflected ceiling plan
RCPT	receptacle
RD	roof drain
REC	recess, receiver
RECIRC	recirculate
RED	reducing
REF	reference
REFR	refrigerator
REG	regulator, register
REINF	reinforcement
REL A	relief air
REM	reminder light set and scan switch,
REM	removable
RET	retaining, return
REV	revise, revision, reversing, revolutions
RF	return fan, radio frequency
RFI	request for information, radio frequency interference
RGSC	rigid galvanized steel conduit
RH	relative humidity
RHC	reheat coil
RHD	relief hood
RI	rubber insulated
RL	refrigerant liquid, roof drain leader
RO	rough opening, reverse osmosis water
RP	radiant panel
RS	refrigerant suction
RTI	response time index
RTP	reinforced thermosetting plastic
RTV	room temperature vulcanized
RV	reduced voltage, relief vent
RW	return wall register
S	sink, soil (piping), sprinkler (piping), sanitary sewer
SA	shock absorber, supply air, sound attenuator
SAF	surge arrester field
SAN	sanitary
SAT	saturation
SB	sitz bath
SC	sill cock, shading coefficient
SCE	stabilized construction entrance
SCF	station connection field
SCH	schedule
SCR	silicone controlled rectifier
SCT	station cable tray
SCW	soft cold water
SCWR	secondary chilled water return
SCWS	secondary chilled water supply

SD	smoke damper, storm drain, sensing device
SDC	station distribution cabinet
SDCT	star-delta-closed transition
SDOT	star-delta open transition
SDR	sound distribution rack
SEC	security
sec	seconds
SECT	section
SEOR	structural engineer of record
SERV	service
SF	supply fan, silt fence, square feet
SFD	smoke actuated fire damper
SG	supply grille
SGB	signal grounding bus
SGL	single
SH	shower, sensible heat
SHW	soft hot water
SHWC	soft hot water circulating
SIM	similar
SIWI	single-inlet, single-width
SL	sliding
SOG	slab on grade
SP	standpipe, sump pump, static pressure, single pole
sp gr, or SG	specific gravity
SPA	setpoint adjustment, spaces
SPD	standpipe drain
SPDT	single pole double throw
SPEC	specification
SPKR	sprinkler, speaker
SPS	security pushbutton switch
SQ	square
SR	supply register
SRV	safety relief valve
SS	service sink, sanitary sewer, stainless steel, storm sewer
SSCG	stainless steel corner guard
SSD	sectional steel door
SSH	Short-slotted holes
SSS	surgeons' scrub sink, solid state starter
SST	stainless steel sink
ST	steam trap
STA	station, stationary
START	starter
STC	sound transmission class
STD	standard
STDWT	standard weight
STIFF	stiffener
STIR	stirrup
STM	steam
STOR	storage
STP	shielded twisted pair
STR	strainer
STRUCT	structural
SUSP	suspended
SV	steam vent
SVD	switched voice and data
SW	supply wall grille, switch, soft water, sidewalk
SWBD	switchboard
SWD	sectional wood door
SWGR	switchgear
SX	steam exhaust
SYM	symmetrical
SYS	system
T	toilet, tank, temperature
T & B	testing and balancing, top and bottom
T & G	tongue and groove
TA	tempered air, transfer air, toilet accessories
TBB	tile backer board
TD	temperature differential
TDC	transverse duct connection
TDH	total dynamic head
TEFC	totally-enclosed fan-cooled
TEL	telephone
TEMP	temperature, temporary
TENV	totally enclosed non-ventilated
TERM	terminal
TH	total heat, total head (pumps)
THD	Total Harmonic Distortion
TOC	top of curb, top of concrete
TOF	top of footing
TONE	tone transfer
TOS	top of steel

TOW	top of wall
TP	total pressure, twisted pair
TPC	textured plastic coating
TPO	thermoplastic olefin
TR	top of register
TSP	total static pressure
T-STAT	thermostat
TSU	thermal storage unit
TU	terminal unit
TV	television
TVSS	transient voltage surge suppressor
TX	transformer
TYP	typical
UC	undercounter
UD	underdrain
UG	underground
UGE	underground electric
UGS	underground signal
UGT	underground telephone
UH	unit heater
UHF	ultra-high frequency
UNEX	unexcavated
UNO	unless noted otherwise
UPS	uninterruptible power supply
UPWC	ultra-pure water circulating
UPWR	ultra-pure water return
UPWS	ultra-pure water supply
UR	urinal
US	utility sink, ultrasound
UTIL	utility
UV	ultraviolet
V	valve, vent, velocity, vacuum
VAC	vacuum, volts alternating current
VAV	variable air volume
VB	vapor barrier, vacuum breaker
VCP	vitrified clay pipe
VCPX	vitrified clay pipe, extra strength
VD	volume damper
VERT	vertical
VEST	vestibule
VF	ventilation fan
VFD	variable frequency drive
VHF	very high frequency
VM	voltmeter
VOC	volatile organic compounds
VOL	volume
VP	vacuum pump, velocity pressure
VR	vapor retarder
VRI	variable volume with reheat interior
VS	venturi station, vacuum (canister) slide
VSI	voltage source inverters
VTR	vent through roof
VV	variable volume
VVR	variable volume with reheat
W	width, waste (piping), water, wire
W/	with
W/O	without
WB	wet bulb
WBT	wet bulb temperature
WC	water closet
WD	wood
WDW	window
WF	wall fin
WG	water gauge
WH	water heater, wall hydrant
WHA	water hammer arrester
WL	wind load
WLD	welded
WM	wattmeter
WP	waterproofing, weatherproof, work point
WPD	water pressure drop
WS	wall switch, waterstop, water softener, waste stack
WT	weight
WWR	welded wire reinforcement
XFMR	transformer
XL	extra long
XLPE	cross linked polyethylene
XP	explosion proof
X-STR	extra strength
Y,W	wye
YH	yard hydrant
YR	year
ZA	zone annunciator
ZN	zone

1.1 ABBREVIATIONS - ORGANIZATIONS AND REFERENCE STANDARDS

A. Where abbreviations and acronyms are used in Specifications, they shall mean the recognized name of the entities in the following list. If not listed, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

B. Materials specified by reference to number, symbol, or title of a specified standard such as a State standard, commercial standard, federal specifications, ASTM or trade-association standard, or other similar standard shall comply with requirements in the revision thereof and any amendments or supplements thereto in effect on date execution of Contract.

C. Standard referred to, except as modified herein, shall have full force and effect as if printed in these specifications.

1. These standards are not furnished to Contractor since manufacturers and trades involved are assumed to be familiar with their requirements.
2. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. By submitting a Bid, Contractor is deemed to represent self as competent to accomplish Work of this Division in conformance with applicable Codes. In case of conflict between the Contract Documents and Code requirements, the Codes shall take precedence. Should such conflicts appear, cease Work on parts of Contract affected and immediately contact Architect in writing. It shall be Contractor's responsibility to correct, at no cost to Owner, work Contractor executes in violation of Code requirements.

E. Perform Work in conformance with latest edition of applicable standards recognized by local Authority Having Jurisdiction (AHJ) at the time of Contract Award, unless otherwise noted in the Construction Documents.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association (see FGIA)
AAPFCO	Association of American Plant Food Control Officials
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Boiler Manufacturers Association
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ACS	American Chemical Society
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ADC	Air Diffusion Council
ADSC-IAFD	International Association of Foundation Drilling.
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest and Paper Association
AF&PA	American Forest & Paper Association
AFI	Air Filter Institute
AGA	American Gas Association
AGC	Associated General Contractors of America
AGI	American Geosciences Institute
AGMA	American Gear Manufacturers Association
AHAM	Association of Home Appliance Manufacturers
AHRI	Air-Conditioning, Heating, and Refrigeration Institute (The)

AI	Asphalt Institute
AIA	American Institute of Architects (The)
AIChE	American Institute of Chemical Engineers
AIPG	American Institute of Professional Geologists
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association International, Inc.
AMP	National Association of Architectural Metal Manufacturers, Architectural Metal Products Division
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	The Engineered Wood Association
APA	APA The Engineered Wood Association
APA	Architectural Precast Association
APHA	American Public Health Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ARI	American Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ARS	American Rail Standard
ASA	Acoustical Society of America
ASA	American Standard Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality
ASSE	American Society of Safety Engineers (The)
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
ATIS	Alliance for Telecommunications Industry Solutions
AWCI	Association of the Wall and Ceiling Industry
AWEA	American Wind Energy Association
AWI	Architectural Woodwork Institute
AWMAC	Architectural Woodwork Manufacturers Association of Canada
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI, Inc.
BIFMA	Business and Institutional Furniture Manufacturers Association
BISSC	Baking Industry Sanitation Standards Committee
BWF	Badminton World Federation
CAC	California Administrative Code
CARB	California Air Resources Board
CASE	Coalition of American Structural Engineers
CBMA	Certified Ballast Manufacturers Association

CBP	United States Customs and Border Protection
CCR	California Code of Regulations
CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association;
CEMA	Conveyor Equipment Manufacturers Association
CFFA	Chemical Fabrics and Film Association, Inc.
CFR	US Code of Federal Regulations
CFSEI	Cold-Formed Steel Engineers Institute
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America
COE	US Army Corps of Engineers
CP	Comprehensive Procurement Guide (EPA)
CPA	Composite Panel Association
CPSC	Consumer Product Safety Commission
CPUC	California Public Utilities Commission
CRA	California Redwood Association
CRI	Carpet and Rug Institute (The)
CRRC	Cool Roof Rating Council
CRREL	Cold Region Research Engineering Lab
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Department of Commerce)
CSA	Canadian Standards Association
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute
CWC	Composite Wood Council
DASMA	Door and Access Systems Manufacturers Association
DBIA	Design-Build Institute of America
DHI	Door and Hardware Institute
DHS	United States Department of Homeland Security
DIN	Deutsches Institut für Normung, eV
DIPRA	Ductile Iron Pipe Research Association
DOC	US Department of Commerce
DOD	US Department of Defense
DSA	California Department of the State Architect
ECA	Electronic Components Association
ECAMA	Electronic Components Assemblies & Materials Association
ECIA	Electronic Components Industry Association
EIA	Electronics Institute of America
EIFSA	Exterior Insulation Finish Systems Association
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
EPA	Environmental Protection Agency
ESD	Electrostatic Discharge Association
ESTA	Entertainment Services and Technology Association
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories)
EVO	Efficiency Valuation Organization
FAA	Federal Aviation Administration (US Department of Transportation)
FCC	United States Federal Communications Commission
FCI	Fluid Controls Institute, Inc.
FEMA	Federal Emergency Management Agency
FG	Federal Government Publications

FGI	Facilities Guidelines Institute
FGIA	Fenestration and Glazing Industry Alliance
FHWA	Federal Highway Administration (US Department of Transportation)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)
FIDIC	International Federation of Consulting Engineers
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM	Factory Mutual (FM Global)
FM Approvals	FM Approvals LLC
FR	Federal Register
FRPI	Fiberglass Reinforced Plastics Institute
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FS	Federal Specification
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America (now NGA)
GS	Green Seal
GSA	General Services Administration
HCAI	California Department of Health Care Access and Information (formerly OSHPD)
HEI	Heat Exchanger Institute
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association
HMI	Hoist Manufacturers Institute
HMMA	Hollow Metal Manufacturers Association
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
HUD	United States Department of Housing and Urban Development
HYDI	Hydronics Institute
IAPMO	International Association of Plumbing and Mechanical Officials
IAPSC	International Association of Professional Security Consultants
IAS	International Accreditation Service
IAS	International Approval Services
IBC	International Building Code
IBI	Intelligent Buildings Institute
IBR	Institute of Boiler and Radiator Manufacturers
ICBO	International Conference of Building Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, LLC
ICEA	Insulated Cable Engineers Association, Inc.
ICPA	International Cast Polymer Alliance
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IES	Illuminating Engineering Society
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IFI	Industrial Fasteners Institute
IGMA	Insulating Glass Manufacturers Alliance (see FGIA)
IGSHPA	International Ground Source Heat Pump Association
IIA	Incinerator Institute of America
ILI	Indiana Limestone Institute of America, Inc.
Intertek	Intertek Group
IPCEA	Insulated Power Cable Engineers Association

IRI	Industrial Risk Insurers
ISA	International Society of Automation (The)
ISAS	Instrumentation, Systems, and Automation Society (The)
ISFA	International Surface Fabricators Association
ISI	Institute for Sustainable Infrastructure
ISO	Insurance Services Office
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITU	International Telecommunication Union
JC	Joint Commission
KCMA	Kitchen Cabinet Manufacturers Association
LBL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy and Environmental Design
LMA	Laminating Materials Association
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MCA	Metal Construction Association
MCAA	Mechanical Contractors Association of America
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MILSPEC	US Military Specification and Standards (DOD)
ML/SFA	Metal Lath/Steel Framing Association
MMA	Monorail Manufacturers Association
MMPA	Moulding & Millwork Producers Association
MPI	Master Painters Institute
MS	Military Specifications
MSS	Manufacturers Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NAAWS	North American Architectural Standards
NACE	National Association of Corrosion Engineers
NADCA	National Air Duct Cleaners Association
NAFM	National Association of Fan Manufacturers
NAIMA	North American Insulation Manufacturers Association
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NAVFAC	Naval Facilities Engineering Command (US Navy)
NBGQA	National Building Granite Quarries Association, Inc.
NBHA	National Builders Hardware Association
NBI	New Buildings Institute
NBS	National Bureau of Standards
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCRP	National Council on Radiation Protection and Measurements
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NECA	National Electrical Contractors Association
NECS	National Electrical Code Standards
NELMA	Northeastern Lumber Manufacturers Association
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	National Forest Products Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council

NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NICET	National Institute for Certification in Engineering Technologies
NIST	National Institute of Standards and Technology
NLGA	National Lumber Grades Authority
NOAA	National Oceanographic and Atmospheric Administration
NOFMA	National Oak Flooring Manufacturers Association
NOMMA	National Ornamental & Miscellaneous Metals Association
NRC	United States Nuclear Regulatory Commission
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSF	NSF International
NSPE	National Society of Professional Engineers
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
NWFA	National Wood Flooring Association
OSHA	Occupational Safety and Health Administration
OSHPD	See HCAI
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PGMC	Primary Glass Manufacturers Council
PLASA	See ESTA
PPI	Plastics Pipe Institute
PS	Product Standards Section (United States Department of Commerce)
PTI	Post Tensioning Institute
PUC	Public Utilities Commission
RCSC	Research Council on Structural Connections (part of AISC)
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
RMA	Rubber Manufacturers Association
RUS	Rural Utility Service (division of Rural Development of the USDA)
SAE	Society of Automotive Engineers
SAE	SAE International
SAMA	Scientific Apparatus Markers Association
SCAQMD	South Coast Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SCS	Scientific Certification Systems
SCTE	Society of Cable Telecommunications Engineers
SD	US Department of State
SDI	Steel Door Institute
SDI	Steel Deck Institute
SEFA	Scientific Equipment and Furniture Association (The)
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers
SFIA	Steel Framing Industry Association
SFPA	Southern Forest Products Association
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance
SPI	Society of the Plastics Industry

SPIB	Southern Pine Inspection Bureau
SPRI	Single Ply Roofing Industry
SRCC	Solar Rating & Certification Corporation
SSINA	Specialty Steel Industry of North America
SSMA	Steel Stud Manufacturers Association
SSPC	Structural Steel Painting Council
SSPC	Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWPA	Submersible Wastewater Pump Association
TCA	Tilt-Up Concrete Association
TCNA	Tile Council of North America, Inc.
TEMA	Tubular Exchanger Manufacturers Association, Inc.
TFS	Texas Forest Service
TIA	Telecommunications Industry Association (The)
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute
TPI	Turfgrass Producers International
TRB	Transportation Research Board
TRI	Tile Roofing Institute
TSA	Transportation Security Administration
UCC	Uniform Commercial Code
UFC	Uniform Fire Code
UL	Underwriters Laboratories, Inc.
UMC	Uniform Mechanical Code
UNI	Uni-Bell PVC Pipe Association
UPC	Uniform Plumbing Code
USAB	United States Access Board
USACE	United States Army Corps of Engineers
USATBCB	US Architectural & Transportation Barriers Compliance Board (USAB)
USAV	USA Volleyball
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USDOJ	Unites States Department of Justice
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council
USGS	United States Geological Survey
USITT	United States Institute for Theatre Technology, Inc.
USP	US Pharmacopeial Convention
USPHS	United States Public Health Service
USPS	United States Postal Service
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCMA	Wood Component Manufacturers Association
WDMA	Window and Door Manufacturers Association
WEF	Water Environment Federation
WI	Woodwork Institute
WSRCA	Western States Roofing Contractors Association
WWEMA	Water and Wastewater Equipment Manufacturers Association
WWPA	Western Wood Products Association

1.2 ABBREVIATIONS - UNITS OF MEASURE

A. Where abbreviations and acronyms are used in Specifications as units of measure, they shall mean as defined in the following list. If not listed herein, they shall mean as listed and defined in ASME Y14.38 “Abbreviations and Acronyms for Use on Drawings and Related Documents.”

B. List below includes units for English System of Units (IP) and International System of Units (SI). Individual specification sections may contain either IP units or SI units, or both.

A (amp)	ampere
acfm	actual CFM
AWG	American Wire Gauge
bf	board foot
Btu	British Thermal Unit
Btuh	British Thermal Units per Hour
C	Celsius
C Value	thermal conductance (BTU/(HR)(SF)(deg F) per inch thickness
cd	candela
cf	cubic feet
cfh	cubic feet per hour
cfm	cubic feet per minute
cm	centimeter
cm/s	centimeters per second
cm2	square centimeter
cm3	cubic centimeter
cm3/s	cubic centimeters per second
cps	cycles per second
cu	cubic
cuft	cubic feet
cu in	cubic inch
cy	cubic yard
dB	decibel
dB/m	decibel/meter
dBmV	decibel millivolts
deg	degree (angular)
degC	degree Celsius
degF	degree Fahrenheit
F	Fahrenheit
fpm	feet per minute
fps	feet per second
ft	feet
fv	face velocity
g	gram
gal	gallon
gal/sf	gallons per square foot
GHz	gigahertz
gph	gallons per hour

gpm	gallons per minute
gps	gallons per second
gr	Grains
gsf	gross square feet
hp	horsepower
hr	hour
Hz	hertz
in	inch
in Hg	inches - mercury
in wg	inches - water gage
in-lb	inch-pounds (force)
J	joule
K	kelvin
K	kip
k value (SI)	thermal conductivity (W/mK)
k value (IP)	thermal conductivity (BTU/(HR)(SF)(F/IN)
kg	kilogram
kHz	kilohertz
kip	thousand pounds
kJ	kilojoule
km	kilometer
km/h	kilometer/hour
kNm	kilonewton meter
kPa	kilopascal
ksf	kips per square foot
ksi	kips per square inch
kV	kilovolt
kVA	kilovolt ampere
kVAR	kilovars
kW	kilowatt
kWh	kilowatt-hours
L	liter
L/h	liters/hour
L/s	liters/second
lb	pound
lbf	pound force
LF	linear foot
lm	lumen
Lpf	liters per flush
lx	lux
m	meter
m/h	meters/hour
m/s	meters/second
m2	square meter
m3	meters cubed

mA	milliamps
MBH	thousand BTU/HR
MBTU	thousand BTU
MCFH	thousand cubic feet per hour
MHz	megahertz
mHz	millihertz
min	minute
mL	milliliter
mL/s	milliliter/second
mm	millimeter
MPa	megapascal
mph	miles per hour
mV	microvolts
MVA	Megavolt-amperes
N	newton
nsf	net square feet
oz	ounce(s)
Pa	Pascal
pcf	pounds per cubic foot
pcy	pounds per cubic yard
ppm	parts per million
psf	pounds per square foot
psi	pounds per square inch
psia	Pounds per square inch absolute
psig	pounds per square inch gage
Q	total heat transfer (BTUH)
R value (SI)	thermal resistance (m2K/W)
R value (IP)	thermal resistance (HR)(SF)(degF)/BTU
rH	relative humidity
rpm	revolutions per minute
rps	revolutions per second
s, sec	second
scfm	standard CFM
sf	square feet
sqft	square foot
sq in	square inch
t	ton
TR	tons refrigeration
U value (SI)	thermal conductance (1 divided by total R value) (W/m2K)
U value (IP)	thermal conductance (1 divided by total R value) (BTU/(HR)(SF)(F)
µV	microvolts
V	volt
VAC	volt AC
VAR	volt amperes reactive
VDC	volt DC

W	watt
W/m	watts/meter
yd	yard

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Provisions followed by an asterisk (*) include some or all provision as obtained from AIA Document A201- General Conditions of the Contract for Construction.

1.2 SECTION INCLUDES

A. Quality assurance and control.

B. Regulatory requirements.

C. Tolerances.

D. Mock-ups.

E. Manufacturer's field services.

1.3 QUALITY ASSURANCE AND CONTROL

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

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

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

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

E. Work to be performed by persons qualified and experienced to produce Work of specified quality.

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

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

H. Materials shall be compatible with one another and with other materials with which they may come in contact.

1.4 SUPERVISION AND CONSTRUCTION PROCEDURES

A. Contractor shall supervise and direct Work, using Contractor’s best skill and attention. *

B. Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures and for coordinating all portions of Work under the Contract, unless Contract Documents give other specific instructions concerning these matters. *

C. Whether or not Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall review, substantiate, and comply with current industry execution standards and manufacturer's current execution instructions and evaluate jobsite safety thereof and shall be fully and solely responsible for jobsite safety of such means, methods, techniques, sequences, or procedures. *

1. If Contractor determines that such means, methods, techniques, sequences, or procedures may not be safe, the Contractor shall give timely written notice to Owner and Architect and shall not proceed with that portion of Work without further written instructions from Architect. *

2. If Contractor is then instructed to proceed with the required means, methods, techniques, sequences, or procedures without acceptance of changes proposed by Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences, or procedures. *

D. Contractor shall be responsible to Owner for acts and omissions of Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of Work for, or on behalf of Contractor or any of its Subcontractors. *

E. Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work. *

F. Contractor is solely responsible for coordination of scope of Work for its own forces, and of Subcontractors and suppliers, and to complete all Work, whether performed by the Contractor or a Subcontractor.

G. Contractor shall employ Licensed Surveyor to locate and stake out Work and establish necessary reference and benchmarks.

1. Work from established benchmarks and reference points, layout and correctly establish lines, levels, grades, and locations of all parts of their own Work and be responsible for their accuracy and proper correlation with Work and established data.

1.5 REGULATORY REQUIREMENTS

A. Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of Work. *

B. If Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction, including, but not limited to, any penalties, fines or other damages realized. *

C. When Contract Documents require Contractor, Subcontractor, Vendor, or other supplier to provide selection or design of parts of Work, such selection or design shall meet requirements of Municipal, State or other governmental authorities having jurisdiction.

1.6 TOLERANCES

A. Monitor fabrication and installation tolerance control of Products to produce approved Work.

1. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances.

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

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

1.7 MANUFACTURER'S FIELD SERVICES AND REPORTS

A. When field services are specified, have material or product suppliers or manufacturers provide technically competent staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting and balancing of equipment, and supervise installation where specified, and to initiate instructions when necessary.

B. Report observations, and site decisions or instructions given to applicators or installers which are supplemental or contrary to manufacturer's written instructions.

C. Submit report in duplicate within 30 days of observation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 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.

END OF SECTION

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SECTION 01 45 33
SPECIAL INSPECTIONS AND TESTING PROGRAM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Contractor responsibilities for special inspection and testing.
2. Special Inspection program and reporting requirements.
3. Attachment A to this Specification Section includes the Submittal of Special Inspections.
4. Attachment B to this Specification Section includes Special Inspector qualifications, reporting requirements, and material specific inspections and tests.
    a. This information is for the Contractor reference only and is not part of the Contract Documents.
    b. It is included to assist the Contractor in understanding the Owner-provided Services so that those services may be factored into the Contractor's pricing and schedule.
    c. The Service Provider(s) responsible for the Owner-provided Services will be selected after Contract award.

B. Purpose:

1. This Document was developed to address the requirements of the 2018 International Building Code IBC, section 1704.1, including:
    a. One or more special inspectors will be hired by the Owner or the Owner's Agent to provide inspections during constructions on the types of work listed under Section 1704.
2. A Statement of Special Inspections will be submitted to the Building Code Official as a condition for permit issuance. This statement is included as Attachment A to this Specification. Attachment B includes a complete list of materials and work requiring special inspections, the inspections to be performed and a list of the minimum qualifications of the individuals, approved agencies or firms intended to be retained for conducting such inspections.

C. Related Specification Sections include but are not necessarily limited to:

1.2 DEFINITIONS

A. Special Inspector: Representative of the Owner approved inspection agency designated for that portion of the work.

B. Testing Agency: Approved agency, not affiliated or hired by the Contractor, which is responsible for the materials testing requirements of the project including but not limited to concrete cylinder breaks, soils testing, and masonry materials testing.

C. Statement of Special Inspections: Document provided to the Building Code Official outlining special inspections and tests to be done on the project and frequency of required test.

D. Soils Engineer or Geotechnical Engineer: For the purposes of Special Inspection "Soils Engineer," "Geotechnical Engineering," and "Special Inspector" shall be interchangeable as pertains to the Division 31 specifications.

E. NICET: National Institute for Certification in Engineering Technologies.

1.3 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with testing agency personnel, special inspector, and agents of the Building Code Official and provide access to the work.

1. Providing access to the work shall include all labor and facilities to perform inspections and tests as listed in the specifications for the duration of the inspections or tests involved.
2. Provide means to obtain and handle samples taken on site.

B. Attend a pre-construction meeting to coordinate and clarify inspection and testing procedures, requirements.

C. Notify special inspector and/or testing agency of work to be inspected/tested minimum of 24 hours prior.

D. Work for which special inspections are required shall remain accessible and exposed for the purposes of special inspections until completion of required special inspections.

E. Any portion of work that is not in conformance shall be corrected and re-inspected. Such portions of the work shall not be covered or concealed until authorized by Owner's Representative.

F. Work to be inspected should be complete at time of inspector's arrival on-site.

G. Payment for Special Inspection services will be in accordance with the following:

1. Payment described below is for the Testing Agency and Special Inspector costs and does not include the Contractor's costs listed in Paragraph 1.3 A.
2. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined in Item 4 below.
    a. Inspection reveals work is satisfactory.
    b. Owner pays all costs associated with this inspection.
3. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined in Item 4 below.
    a. Inspection reveals work is deficient.
    b. Contractor corrects deficiencies within timeframe defined in Item 4) below.
    c. Work is re-inspected and work is satisfactory.
    d. Owner pays all costs associated with this inspection.
4. After Contractor notification, inspector arrives at site and work is not ready for inspection when inspector arrives.
    a. Inspector will remain on-site for a maximum of 2 hours awaiting the completion of the work.
    b. If work is not ready for inspection at the end of this period, inspector will be dismissed until Contractor requests re-inspection.
    c. All costs associated with this inspection trip will be charged to the Contractor.
5. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined above.
    a. Inspection reveals work is deficient.
    b. Contractor attempts to correct deficiencies within 2 HR timeframe and calls for re-inspection.
    c. Work is re-inspected and found to still be deficient.

d. Inspector will be dismissed.

e. All costs associated with this inspection trip will be charged to the Contractor.

6. Owner will pay for "passing" soils on the Project. Costs of corrective actions and cost of failed test areas requiring retesting are the sole responsibility of the Contractor. For additional specific payment requirements for soils see the respective Division 31 Section.

H. Special Inspection is intended to be an independent quality assurance. Special Inspections shall not relieve the Contractor of any quality assurance, quality control, workmanship, or warranty responsibilities. Contractor's own personnel shall review all work to be inspected for conformance with Contract Documents prior to calling for inspection.

1.4 REPORTING DUTIES AND AUTHORITY

A. A pre-construction meeting to coordinate and clarify inspection, testing, and procedural requirements will be held per Section 01 42 00.

1. The meeting is to be attended by:

a. Owner.

b. Engineer.

c. Building Code Official or designee.

d. Testing Agency and Special Inspectors.

e. General Contractor.

f. Appropriate Sub-contractor(s).

B. Special Inspector shall report all deficient work to the Contractor as soon as possible.

1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer and the Building Code Official.

C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

ATTACHMENT A TO SECTION 01 45 33

SUBMITTAL OF SPECIAL INSPECTIONS

Statement Date:

Project Name: OPPD Elkhorn Storage Building No 1
Project Address: 1101 N 180th St Omaha, NE 68022
Owner: OPPD
Registered Design Professional in Responsible Charge (DPRC):

The Statement of Special Inspections (Statement) is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the Building Code. The Special Inspection program is outlined in Specification Section 01 45 33 and Attachments A and B. A detailed explanation of the requirements for Special Inspections and Testing can be found in specification Section 01 45 33 of the Project Manual in conjunction with the Technical Specifications for each material.

Bi-weekly Special Inspection reports will be submitted to the DPRC and the Building Official. Discovered discrepancies will be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies will be brought to the attention of the DPRC and the Building Official. Only documents that are prepared and signed or sealed by the Special Inspectors (SI) are valid.

The SI is responsible for verifying all information on each document prior to signing or sealing and directly forwarding it to the DPRC and Building Official. The SI is responsible for verifying all inspectors under his supervision maintain current certifications during the course of the project. At the conclusion of each individual Special Inspection type, the SI will complete a Final Report.

The Special Inspection program does not relieve the Contractor or any other entity of any contractual duties, including quality control, quality assurance, or safety. The Contractor is solely responsible for construction means, methods, and job site safety. Failure to adhere to the SI program as outlined herein may result in a stop work notice being issued by the Building Official.

Respectfully submitted,
Design Professional in Responsible Charge,

Type or Print Name

License #
Expires:

Signature Date

END OF ATTACHMENT A

ATTACHMENT B TO SECTION 01 45 33

SPECIAL INSPECTIONS, INSPECTOR QUALIFICATIONS AND REPORTING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Specification Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 03 05 00 - Concrete
4. Section 05 50 00 - Metal Fabrications.
5. Section 13 34 19 – Metal Building Systems.
6. Section 31 23 00 - Earthwork.

1.2 QUALIFICATIONS

A. Qualifications stated here are the minimum recommended by the Engineer. If the Building Code Official has more stringent qualifications, the more stringent qualifications will take precedence.

B. All Special Inspections and Testing to be done under the direction of a Professional Engineer or Registered Architect registered in the State of Nebraska herein referred to as Registered Professional for Special Inspections (RPSI).

C. Soil, concrete, masonry, mortar, grout, steel and aluminum related testing.

1. The Testing Agency shall have a minimum of 10 years experience in the testing of these materials.
2. The Testing Agency's technician(s) conducting this testing:
   a. Shall have a minimum of five years experience in the testing of soil, concrete, mortar, grout, steel and aluminum as appropriate.
3. Concrete related work:
   a. International Code Council certification for Reinforced Concrete and American Concrete Institute Concrete Field Testing Technician – Grade 1.

D. Special Structural Inspections:

1. Professional Engineers or Architects, licensed in the State of Nebraska, may perform special inspections in accordance with their license qualifications.
2. Other individuals, working under the direct supervision of a licensed engineer and meeting the following qualifications, may perform special inspections.
3. Soils related work:
   a. NICET Level II Certification in geotechnical engineering technology/construction; or
   b. Registered Geologist; or
   c. Engineer Intern under the direct supervision of a Licensed Professional Engineer.
4. Concrete related work:
   a. International Code Council certification for Reinforced Concrete Special Inspector or American Concrete Institute Concrete Construction Special Inspector.
   b. Alternatively, may be an Engineer Intern under the direct supervision of a Licensed Professional Engineer.
5. Steel and aluminum related work:
   a. Frame and material verification IBC Table 1704.3, Items 3 and 6:
   b. Welding:

1) American Welding Society as a Certified Welding Inspector; or
2) International Code Council Structural Steel and Welding Certification and American Welding Society Qualified and one year of related experience; or
3) NDT Level II or II Certificate (for non-destructive testing only).

c. High strength bolting:
1) International Code Council Structural Steel and Welding Certification and one year related experience.
2) Alternatively, may be an Engineer Intern with appropriate training.

6. Other equivalent certifications will not be acceptable unless approved by the Engineer.

1.3 REPORTING DUTIES AND AUTHORITY

A. Reporting requirements for special inspector per IBC 2018 for Building System Related Work.

1. Comply with requirements of IBC Section 1704.1.2.
2. Provide written documentation of all inspections and testing.
a. Include exact location of work.
b. If testing of specimens is included, include detailed information on storage and curing of specimens prior to testing.
3. Furnish inspection and test reports to the Contractor, the Engineer's Project Manager and the Owner's on-site representative.
a. Indicate that work inspected was done in conformance with approved construction documents.
b. Immediately report any discrepancies to the Contractor for correction.
c. If the discrepancies are not corrected in a timely fashion, notify the Engineer's Project Manager and Owner's on-site representative.
4. Issue an electronic report summarizing all inspections, corrective action notifications and resolution of discrepancies and non-conforming work every two weeks (14 calendar days).
a. Copy will be available to:
1) Engineer's Project Manager.
2) Owner.
3) The Building Code Official.
4) General Contractor.
5. At the end of the Project, the RPSI shall compile all test reports for each inspected material and for each Special Inspector and summarize into a single PDF and submit to the Engineer and Building Code Official.
a. Final summary report to be signed and sealed by a Registered Professional for Special Inspections stating:
1) The required Special Inspections have been performed.
2) All discrepancies have been resolved except as specifically stated in the summary report.

B. Special Inspector shall report all deficient work to the Contractor as soon as possible.

1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer and the Building Code Official.

C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

1.4 MATERIAL SPECIFIC SPECIAL INSPECTIONS AND TESTS

A. Material specific requirements for special inspection and testing are listed in the technical specifications listed below. Special inspection and testing requirements will be located in each appropriate technical specification under "SOURCE QUALITY CONTROL", "FIELD QUALITY CONTROL" and/or "QUALITY ASSURANCE" as appropriate for each material.

1.5 SOILS

A. Special Inspection/testing will be provided per IBC as required to determine that the site has been prepared in accordance with the approved soils report, and to verify the allowable soil bearing pressure, materials, compaction densities, trenching and backfill and conformance to the project Specifications.

B. Inspection/testing requirements are listed separately in Specification Division 31 and are indicated as the work to be done by the Geotechnical Engineer, Testing Agency, or Special Inspections and Testing Provider.

1.6 CONCRETE

A. Special Inspection and testing will be provided per IBC. Inspection is required for material verification, reinforcing steel, embedded bolts, mechanical splices, concrete tests, welding of reinforcing and concrete placement and curing.

B. Inspection and testing requirements are listed separately in Specification Section 03 05 00 and are indicated as the work to be done by the Special Inspector or Testing Agency.

1.7 STEEL, STAINLESS STEEL, AND ALUMINUM

A. Special Inspection will be provided for structural steel and aluminum per IBC. Inspection is required for material verification, high-strength bolting, welding and other work noted on the Contract Documents.

B. Inspection/testing requirements are listed separately in Section 05 50 00 and are indicated as the work to be done by the Special Inspector. Inspection requirements listed are applicable to aluminum, stainless steel, and structural steel.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF ATTACHMENT B

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SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Performance of product, material, or system is result of manufacturing, fabrication, installation procedures, use, and maintenance:

1. Therefore, Architect endeavors to specify quality levels for products, materials, or systems that are advertised to conceptually meet performance goals and desired attributes for Project.
    a. For most conceptually equal systems and materials, the Architect may specify multiple manufactures.
    b. In some cases, based on quality and attribute goals for Project, number of manufacturers may be limited.

B. Product, material, or system substitutions:

1. Prior to bid: See Section 00 26 00.

1.2 SPECIFYING METHODS AND PRODUCT OPTIONS

A. Method 1: Products are specified by naming two or more manufacturers. Substitutions are not permitted. Any one of manufacturers named may be used that meet specified requirements.

B. Method 2: Products are specified by naming one or more manufacturers. Substitutions are permitted. Any one of manufacturers named may be used that meet specified requirements. Submit a substitution request for any manufacturer not specifically named.

C. Method 3: Proprietary: No Substitutions. Products are specified by naming only one manufacturer.

D. Method 4: “Base” and “Optional”.

1. Base:
    a. Manufacturer listed as Base in Part 2 of specification section.
    b. Manufacturer listed as Base is particular manufacturer of a specific product used as basis of design.
        1) Products of the Base manufacturer are specific products, assemblies or systems used and identified with model numbers, dimensions, or other identifying features.
2. Optional:
    a. Manufacturer listed as Optional in Part 2 of specification section.
    b. More than one manufacturer may be listed as Optional.
    c. Proposals may be based on any of the manufacturers listed.
    d. Manufacturers listed as Optional are particular manufacturers of products similar to the specific product used as basis of design.
    e. Optional products are listed without model numbers, dimensions, or other identifying features.
    f. Listing manufacturer as Optional indicates acceptance of that manufacturer as supplier of a product to extent product complies with specified descriptive requirements listed in technical specification, including salient qualities provided by Base manufacturer’s product.
        1) Salient qualities include, but are not necessarily limited to following:
            a) Purpose and function.
            b) Material and finish.

c) Strength, durability, and other applicable physical properties.

d) Compatibility and performance attributes for indicated application.

e) Capacity and operating characteristics, where applicable.

f) Size and configuration to extent required for fit with adjoining and adjacent conditions and within spatial limitations.

g) Appearance, including exposed dimensions, profile, texture, pattern, and color, where visible to personnel in finished space, or from exterior.

2) Optional Products that significantly differ in appearance or quality of Base product will not be accepted.

g. Contractor is responsible for costs to provide dimensional, operational, structural, utility, or other related adjustments to fit an Optional manufacturer's product into Work.

h. Submit Substitution Form with Bid for the Optional product.

3. Refer to specification sections for additional requirements.

E. Method 5: Generic: Products are specified by reference standard, by performance, by description or by any combination of these three.

1. Products meeting or exceeding specification requirements may be used.

2. Contractor assumes responsibility for compatibility of products selected.

F. Method 6: Visual Matching: Where specifications and drawings require matching existing materials or a sample, the Architect's decision on whether a proposed product matches is final. Where no product matches or complies with other requirements, comply with specified substitution requests and submittal procedures.

1.3 DEFINITIONS

A. "Product" means material, machinery, components, equipment, fixtures, and systems forming Work. The term does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. New Products: Items not previously incorporated into another project or facility, except products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Cutting and Patching in accordance with provisions of Contract Documents.

B. Completely coordinate with the work of other trades.

1.2 DESCRIPTION

A. This section covers cut and patch work either in remodel, add-on or new construction as necessary for execution of the Work.

B. Install Work in such a manner and sequence as to preclude or minimize cutting and patching of new Work.

C. Execute cutting, including excavation, fitting or patching of Work, required to:

1. Make several parts fit properly.
2. Uncover Work to provide for installation of ill-timed Work.
3. Remove and replace defective Work.
4. Remove and replace non-conforming Work.
5. Remove samples of installed Work for testing.
6. Install specified Work in existing construction.
7. Provide rerouting penetrations of non-structural surfaces for installation of piping and electrical conduit.
8. Patch and repair fireproofing damaged after installation of other Work or demolition activities.
9. Remove and finish construction at connections to other structures.
10. Remove existing roofing where required by new Work, and patch to match existing roofing.

D. Do not endanger any Work or Work of other Contractors, by cutting, excavating, or otherwise altering Work except with written consent of Contractor subject to review by Architect.

E. Do not cut into or cut away structural concrete, other concrete or other structural members nor dig under foundations or into structural walls or other parts, or in any case allow same to be done without full knowledge and written consent of Architect.

F. Repair or replace damaged work resulting from violation of these provisions.

G. Use only firms or individual trades qualified to perform Work required under this Section.

1.3 QUALITY ASSURANCE

A. Employ skilled persons experienced with material requiring cutting and patching.

1. To the greatest extent practicable, employ original installer to perform cutting and patching for weather-exposed and moisture-resistant components, and sight-exposed surfaces.

B. Written Requests:

1. Submit requests in advance of cutting or alteration which affects:
   a. Structural integrity of any component of Project.
   b. Integrity of weather-exposed or moisture-resistant component.
   c. Efficiency, maintenance, or safety of an operational component.
   d. Visual qualities of sight-exposed components.
   e. Work of Owner or separate contractor.

2. Include in Request:
    a. Location and description of affected work.
    b. Necessity for cutting or alteration.
    c. Description of proposed work, and products to be used.
    d. Alternatives to cutting and patching.
    e. Effect on work of Owner or separate contractor.
    f. Written permission of affected separate contractor.
    g. Date and time work will be executed.

C. Proceed with cutting and patching at the earliest feasible time and complete without delay.

D. Operational Limitations:

1. Cut and patch operating elements or related components in a manner that results in maintaining their capacity to perform as intended.
2. Cut and patch operating elements or related components in a manner that does not result in increased maintenance or decreased operational life or safety.

E. Structural Work:

1. Cut and patch structural elements in a manner that maintains their load-carrying capacity or load-deflection ratio.
2. Follow applicable NFPA Standards when torch cutting is required.

F. Visual Requirements:

1. Cut and patch construction exposed on exterior or in occupied spaces in a manner to, in Architect's opinion, retain the building's aesthetic or visual qualities.
2. Cut and patch construction in a manner to avoid visual evidence of cutting and patching.
3. Remove and replace construction which was cut and patched in a visually unsatisfactory manner.

G. Warranties and Existing Warranties:

1. Replace, patch, and repair material and surfaces cut or damaged by methods and with materials and in such manner to maintain warranties.

1.4 JOB CONDITIONS

A. Before start of Work, obtain and pay for permits required by authorities having jurisdiction and notify utilities companies.

B. Obtain approval of Owner and authorities having jurisdiction for Work which affects existing means of egress.

1. Review with and obtain approval of authorities for temporary construction.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Protect existing construction during cutting and patching to prevent damage.

E. Provide protection from adverse weather conditions.

F. Avoid cutting existing utilities, pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until alternate provisions have been provided.

1.5 SUBMITTALS

A. Shop Drawings:

1. Provide dimensioned drawings showing position and size of sleeves and openings in relation to structural grid of building, equipment, and other assemblies.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials identical to existing materials.

B. For exposed surfaces, use materials that visually match existing adjacent surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used.

C. Use materials whose installed performance will equal or surpass that of existing materials.

D. Where applicable, comply with specifications for type of Work to be performed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to bid, become knowledgeable of existing facilities, utility requirements and construction.

1. Existing facility documents may be available through the Owner for review.

B. Perform preliminary investigations to determine extent of Work.

1. Conditions evident by such investigation will not be allowed as claim for extra cost.

C. Inspect conditions for work, including elements subject to movement or damage during:

1. Cutting and patching.
2. Excavating and backfilling.

D. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

E. Before proceeding, meet at site with parties involved in cutting and patching, including mechanical and electrical trades.

1. Review areas of potential interference and conflict.
2. Coordinate procedures and resolve potential conflicts before proceeding.

F. After uncovering existing conditions for Work, inspect conditions affecting installation of new products or Work.

3.2 PREPARATION PRIOR TO CUTTING

A. Provide shoring, bracing and support to maintain structural integrity.

B. Provide protection for other affected portions of Project.

C. Provide protection from elements when required.

D. Existing Utility Services and Mechanical/Electrical Systems:

1. Bypass existing utility services and building systems to be removed, relocated, or abandoned, before cutting to prevent interruption to occupied areas.

E. Maintain excavations free of water.

3.3 CUTTING AND REMOVAL - GENERAL

A. Execute fitting and adjustment to provide finished installation to comply with specified tolerances and finishes.

B. Execute cutting with methods to avoid damage of existing or other Work and provide surfaces to receive installation of new Work.

C. Perform backfilling as specified in applicable sections.

D. Neatly cut and remove materials, and prepare openings to receive new work.

E. Remove masonry or concrete in small sections.

F. Provide shoring, bracing, and other supports to prevent movement, settlement, or collapse of remaining or adjacent wall areas, structure, or facilities.

G. Arrange shoring, bracing, and supports to prevent overloading of structure.

H. Exercise caution to prevent damage to existing remaining work or to adjacent facilities.

I. Execute Work using methods which will prevent interference with use of remaining and adjacent facilities by Owner.

J. Remove existing work indicated to be removed, or as necessary for installation of new Work.

K. Provide for cutting, fitting, repairing, patching and finishing of Work disturbed by installation of new Work.

L. Do not remove or damage fireproofing materials.

1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
2. Repair or replace damaged fireproofing.

3.4 CUTTING

A. Cut existing construction to:

1. Provide for installation of other components or performance of other construction activities, and subsequent fitting and patching to restore surfaces to their original condition.
2. Fit products together, to integrate with other work.
3. Uncover work to install ill-timed work.
4. Remove and replace defective and non-conforming work.
5. Provide openings for mechanical and electrical penetrations.

B. Cut existing construction using methods least likely to damage components to be retained or adjoining construction.

1. Where possible, review proposed procedures with original installer or comply with original installer's recommendations.
2. Use hand or small power tools designed for sawing or grinding, not hammering and chopping.
    a. Cut holes and slots to size required, with minimum disturbance of adjacent surfaces.
    b. Temporarily cover openings when not in use.
3. Cut or drill existing finished surfaces from exposed or finished side into concealed surfaces.
4. Cut concrete and masonry using a carborundum saw or diamond core drill.
5. Comply with requirements of Division 31, where cutting and patching requires excavating and backfilling.
6. Bypass portions of existing utility services to remain, removed, relocated or abandoned, before cutting.
    a. Cut pipe or conduit partitions to be removed in walls.
    b. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.

3.5 CUTTING IN CONCRETE CONSTRUCTION

A. Do not cut or core drill openings or holes in beams, joists, and columns without prior written approval of Architect.

1. Comply with additional requirements and instructions of Architect.

B. In members other than beams, joists, and columns and unless shown on architectural or structural drawings; obtain prior written approval of Architect for openings larger than 10 inches in any dimension, or where dimension between 2 openings in less than 2 times maximum dimension of largest opening.

C. At floor slabs and walls to be core drilled or cut, locate and mark reinforcing in both faces by means of x-ray, ground penetrating radar, pachometer, or profometer.

1. Submit drawings showing location of rebar and proposed cuts or cores for review.

D. When written approval is obtained, comply with additional requirements and instructions of Architect.

3.6 CUTTING IN STEEL FRAME AND METAL DECK CONSTRUCTION

A. Do not cut nor drill holes in webs and flanges of columns, beams, purlins, and joists without prior written approval of Architect.

1. When approval is obtained, comply with requirements and instructions of Architect and provide reinforcing at such locations when required.

B. When openings are cut into metal decks having cast-in-place concrete slab over metal deck:

1. No reinforcing of holes is required for circular openings or sleeves up to 6 inches diameter and for rectangular openings having no side dimension greater than 6 inches.
2. Reinforce openings greater than 6 inches.
3. Obtain prior written approval of Architect for openings not shown on architectural or structural drawings.
    a. Comply with additional requirements and instructions of Architect.

C. When openings are cut into metal roof decks that have no concrete cast-in-place (except lightweight insulating cementitious roof fill) over deck:

1. No reinforcing of holes is required for circular openings less than 6 inches diameter and for rectangular openings having no side dimension greater than 6 inches.
2. Reinforce openings between 6 inches and 12 inches, with 20 GA flat steel sheet 12 inches greater in dimension than opening; fusion weld to top surface of deck at each corner and on each side midway between corners.
3. Do not cut openings greater than 12 inches without prior written approval of Architect.
    a. Comply with requirements and instruction of Architect.

3.7 MATCHING AND PATCHING

A. Where items are removed from existing walls, ceilings, floors or partitions to remain, repair wall, ceiling, floor or partition disturbed by removal.

B. Where walls, ceilings, floors or partitions are removed, repair abutting walls, ceilings or floors disturbed by removal.

C. Where existing construction is cut, removed or otherwise disturbed to permit installation of new Work, match and patch existing disturbed construction.

D. Install new products to provide completed Work in accordance with requirements of Contract Documents.

E. Use methods and materials similar in appearance, and equal in quality to areas or surfaces being repaired.

F. Patch Work to match existing work and adjacent surfaces.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

1. Refinish continuous surfaces to nearest intersections.
2. Refinish assemblies entirely.

H. Remove and replace existing ceilings and finishes for installation of Work, if not shown to be removed on Architectural Drawings and Schedules.

1. If existing ceiling cannot be satisfactorily reinstalled, replace with like materials and construction.

I. Repair or replace non-coordinated or defective Work, or Work not conforming to Contract Documents.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Owner has established that this Project shall include proactive measures for waste management participation by all parties to the contract.

1. The purpose of this program is to ensure that during the course of the Project all diligent means are employed to pursue practical and economically feasible waste management and recycling options.
2. Upon award, each subcontractor shall be required to furnish documentation from suppliers or manufacturers regarding waste management and recycling options for those products and procedures furnished.
3. Waste disposal to landfills shall be minimized.

B. Definitions:

1. Waste: Any material that has reached the end of its intended use. Waste includes salvageable, returnable, recyclable, and reusable construction materials that would otherwise be discarded or destroyed.
2. Construction waste: Solid wastes including, but not limited to, building materials, packaging materials, debris and trash resulting from construction operations.
3. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or Waste to Energy facility acceptable to authorities having jurisdiction.
4. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
5. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
6. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.
7. Hazardous waste: Any material or byproduct of construction that is regulated by the Environmental Protection Agency and that may not be disposed in any landfill or other waste end-source without adherence to applicable laws.
8. Trash: Any product or material unable to be returned, reused, recycled, or salvaged.
9. Landfill: Any public or private business involved in the practice of trash disposal.
10. Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site.

1.2 PERFORMANCE GOALS AND REQUIREMENTS

A. General: Develop Waste Management Plan that results in end-of-Project rates for salvage/recycling of a minimum of 50percent by weight of total waste generated by the Work.

1.3 SUBMITTALS

A. Implementation Plan:

1. Construction Waste Management Plan.

B. Progress Reports:

1. Submit reports concurrent with each Application for Payment, submit copies of report. Include separate report for demolition and construction waste. Include the following information:
   a. Material category.

b. Total quantity of waste in tons.
c. Quantity of waste salvaged, both estimated and actual in tons.
d. Quantity of waste recycled, both estimated and actual in tons.
e. Total quantity of waste recovered (salvaged plus recycled) in tons.
f. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Project Closeout:

1. Waste Reduction Calculations: Before request for Substantial Completion, submit copies of calculated end of Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
2. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
3. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
4. Recycling and Processing Facility Records: Indicate receipt and acceptance of waste by landfills and Waste to Energy facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Conference: Project Manager shall conduct conference at Project site to review methods and procedures related to waste management including but not limited to, the following:

1. Review and discuss Waste Management Plan.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.5 CONSTRUCTION WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed in landfill or Waste to Energy facilities. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone number.
3. Recycled Materials: Assign recycling to recycling subcontractor, or list local receivers and processors, and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and Waste to Energy facility. List hazardous material waste and disposal separately.
5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Waste Management Plan shall include locations of sorting and waste storage facilities on Site Plan of project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Implement waste management plan as approved by Architect.

1. Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.
    a. Common materials may include drywall, wood, scrap metals, brick, and concrete. Finish materials such as floor or ceiling tiles may also be included.
2. Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project.
3. Provide where the material will be taken and how the recycling facility will process the material.
4. Alternative daily cover (ADC) does not qualify as material diverted from disposal.
5. Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion.

B. Implement the following practices to ensure construction waste is handled and diverted properly.

1. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
2. Define specific areas to facilitate separation of materials for recycling, salvage, reuse or return.
3. If single-stream recycling is not used:
    a. Separate construction waste by type at Project site to the maximum extent practical.
    b. Do not mix recyclable materials.
    c. Recycle and waste bin areas are to be maintained in an orderly manner and clearly marked to avoid contamination of materials. Inspect containers and bins weekly for contamination and remove contaminated materials if found.
4. Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
5. Store materials away from construction area. Do not store within drip line of remaining trees.
6. Store components off the ground and protect from weather.

C. Source Reduction: Identify source reduction strategies. Strategies include:

1. Modular construction, reduced packaging, using industry-standard measurements, and prefabrication.

D. Hazardous Wastes: Store in secure areas and comply with the following:

1. Hazardous wastes shall be separated, stored, and disposed of in accordance with local and EPA regulations and additional criteria listed below:

a. Building products manufactured with PVC or containing chlorinated compounds shall not be incinerated.
b. Disposal of fluorescent tubes and ballasts to open containers is not permitted.
c. Disposal of building elements containing mercury to open containers is not permitted.

E. Unused fertilizers shall not be co-mingled with construction waste.

F. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within seven days of submittal return.
2. Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

G. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

3.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or Waste to Energy facility acceptable to authorities having jurisdiction.

1. Utilize a waste management company that can provide verifiable documentation that the percentage of construction and demolition waste material diverted from the landfill complies with this section.
2. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials on site.

C. Incineration/ Burning: Incineration/ burning of waste materials is not acceptable unless it is a part of a waste to energy diversion strategy.

D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner’s property.

E. Disposal: Transport waste materials off Owner’s property and legally dispose of them.

END OF SECTION

SECTION 01 74 23
CLEANING

PART 1 - GENERAL

1.1 FIRE PROTECTION

A. Store volatile waste in listed disposal containers.

B. Maintain site and building so no condition provides a fire hazard.

C. Remove combustible debris from building at end of each shift and from site daily.

D. Sources of ignition and smoking are prohibited in flammable and combustible storage areas.

E. Do not burn on-site.

1.2 POLLUTION CONTROL

A. Conduct cleanup and disposal operations to comply with codes, rules, regulations, ordinances, and anti-pollution laws.

B. Do not burn or dispose of combustible debris, rubbish, and waste material on site.

C. Do not discharge volatile, harmful, or dangerous materials into storm or sanitary drains or sewer systems.

D. Prevent accumulation of wastes that create hazardous conditions.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Use materials recommended by manufacturers of surfaces to be cleaned.

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

C. Use only those cleaning materials which will not create hazards to health or property and will not damage surfaces.

D. Use only those cleaning materials which will not create hazards to health or property, are non-toxic to both humans and aquatic life, and will not damage surfaces, and comply with the following:

PART 3 - EXECUTION

3.1 GENERAL

A. Clean items installed under this Contract.

1. Leave free of stains, dirt, dust, damage, or defects.
2. Include washing, sweeping, polishing of wall surfaces, floors, windows, hardware, mirrors, lighting fixtures, equipment, etc.

3.2 DURING CONSTRUCTION

A. Provide on-site listed disposal containers for collection of waste materials, debris, and rubbish.

1. Dispose of off-site once a week at an approved solid waste disposal site.
2. Cover container to prevent blowing by wind.

B. Keep work areas clean so as not to hinder health, safety, or convenience of personnel in existing facility operations.

C. Interior cleaning:

1. Clean and vacuum interior space prior to start of painting, and continue cleaning as-needed until substantial completion.
2. Schedule cleaning operations so contaminants do not fall on wet, painted surfaces.
3. Clean and protect Work in progress and adjoining materials in place, during handling and installation.
4. Clean lunch/break area after each use.

D. Exterior cleaning:

1. Wet down dusty materials and rubbish to prevent blowing dust during entire construction period.
2. If use of water is prohibited by law, seek an alternate method to prevent blowing dust.
3. Perform cleaning operations as required during construction to prevent accumulations of dust, soil, and debris.
4. Keep weeds and other vegetation trimmed to 3 inches maximum height.
5. Remove snow and ice from access to buildings.

3.3 FINAL CLEANING

A. At Substantial Completion, perform final cleaning of Work and existing areas wherever any area are left less than clean by construction operations.

1. Complete cleaning operations before requesting review for Substantial Completion.

B. Use experienced professional cleaners for final cleaning.

C. Repair and touch-up marred areas.

D. Broom clean and remove stains from paved surfaces; rake clean other surfaces of grounds.

E. Remove grease, dust, dirt, stains, labels, fingerprints, mastic, adhesive, and foreign materials from interior and exterior surfaces, and fixtures, hardware, and equipment.

F. Wash and shine glazing, mirrors, stainless steel, etc., including existing materials in area of construction.

G. Wipe lighting fixture reflectors, lenses, lamps, and trims clean.

1. Replace burned out lamps.

H. Polish glossy surfaces to a clear shine.

I. Remove temporary protection and facilities installed for protection of the Work during construction.

3.4 FIELD QUALITY CONTROL

A. Prior to Owner occupancy, Contractor and Owner shall conduct an inspection of interior and exterior surfaces and Work areas to verify Project is clean to Owner’s satisfaction.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES (GC)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout.

B. Provisions followed by an asterisk (*) include some or all of the provision as obtained from AIA Document A201 - General Conditions of the Contract for Construction.

1.2 SUBMITTALS

A. Contract Closeout Information:

1. For substantial completion:
   a. Comprehensive list of all items to be completed or corrected.
   b. Contractor's Notice of Substantial Completion.
   c. Certificates of governing authorities.
   d. Submittals required by other Sections.
2. For final completion:
   a. Contractor's Certificate of Completion.
   b. Evidence of payments and release or waiver of liens in triplicate.
      1) Contractor's Affidavit of Payments of Debts and Claims: AIA Document G706.
      2) Contractor's Affidavit of Release of Liens: AIA Document G706A.
      3) Contractor's release or waiver of liens.
      4) Separate releases or waivers of liens for subcontractors, suppliers, and others with lien rights against Owner, together with list of all such parties.
      5) If required by Owner, other data establishing payment or satisfaction of obligations arising out of Contract.
   c. Consent of Surety (if any) to Final Payment: AIA Document G707.
   d. Certificates evidencing that insurance to remain enforce.
   e. Final application for payment.
   f. Initialed list(s) of items to be completed or corrected verifying completion of each items.
   g. List of Subcontractors and equipment suppliers. Include:
      1) Name.
      2) Address.
      3) Telephone number.
      4) Representative.
   h. Letter of site conformance.
   i. Closeout submittals required by other Sections.

1.3 SUBSTANTIAL COMPLETION

A. Substantial Completion is the stage in the progress of Work when the Work or designated portion thereof is sufficiently complete in general accordance with Contract Documents so Owner can occupy or utilize Work for its intended use. *

1. Work will not be considered for Substantial Completion until all systems and equipment are operational; all designated or required governing agency inspections and certifications have been made and posted, instruction of designated Owner's personnel in operation of systems and equipment has been completed, operation and maintenance data has been satisfactorily turned over to Owner, and finishes are in place. In general, the only remaining Work shall be minor in nature, such that Owner may occupy or utilize Work or designated

portion thereof, and completion or correction of Work by Contractor would not materially interfere or hamper Owner's intended business use or operation.

2. Contractor shall certify that all remaining Work will be completed within 30 consecutive calendar days following date of Substantial Completion, or as agreed to in writing, and failure to do so shall automatically reinstate provisions for damages due Owner as contained elsewhere in Contract Document or as provided by law for such period of time as may be required by Contractor to fully complete Work whether Owner has occupied Work or not.

B. Obtain evidence of compliance with requirements of governing authorities:

1. Certificates of inspection of:
   a. Electrical.
   b. Etc.
2. Certificate of Occupancy.

C. When Contractor considers that Work, or a portion thereof which Owner agrees to accept separately, is substantially complete, Contractor shall thoroughly inspect Work, and prepare and submit to Architect a comprehensive list of items to be corrected or completed, and Contractor's Notice of Substantial Completion (utilize form at end of this Section). *

D. Contractor certifies that:

1. Work performed under this Contract has been thoroughly inspected and considered to be sufficiently complete, in accordance with Contract Documents, so Owner can occupy or utilize Work for its intended use.

E. Failure of Contractor to include an item on such list(s) does not alter responsibility of Contractor to complete all Work in accordance with Contract Documents. *

F. Contractor shall proceed promptly to complete and correct the items on list.

G. After receipt of Contractor's comprehensive list of items to be corrected or completed, and Contractor's Notice of Substantial Completion, Architect and Owner will, within reasonable period after notification, review list of items to be completed or corrected, or inspect Work, or designated portion thereof, to determine whether Work is Substantially Complete. *

H. If Architect or Owner review or inspection discloses any item, whether or not included on Contractor's list, which is not sufficiently complete in general accordance with Contract Documents so Owner can occupy or utilize Work or designated portion thereof for its intended use: *

1. Contractor will be notified stating reasons.
2. Contractor shall substantially complete or correct Work.
3. Contractor shall thoroughly re-inspect Work.
4. Contractor shall submit another Contractor's Notice of Substantial Completion, a revised list of items to be completed or corrected, and a request for another review.
5. Architect and Owner will again review list of items to be completed or corrected and Work.

I. If Contractor prematurely submits a Contractor's Notice of Substantial Completion or requests Architect review of Work, and Architect determines that Project or designated portion thereof is not Substantially Complete, Architect may invoice Owner as a change in services for such cost involved in evaluating and reviewing Work, and associated travel costs. Contractor shall reimburse Owner for such costs.

J. Architect will not perform more reviews of sub-projects or phases than number indicated in Contract Documents or Owner – Architect Agreement, unless otherwise mutually agreed to by Architect and Owner.

K. When Work or designated portion thereof is considered Substantially Complete, Architect will prepare a Certificate of Substantial Completion.

1. The Certificate of Substantial Completion shall establish date of Substantial Completion, shall establish responsibilities of Owner and Contractor for security, maintenance, heat, utilities, damage to Work and insurance, and shall fix time within which Contractor shall complete and correct Work.
2. Warranties and guarantees required by Contract Documents shall commence on date of Substantial Completion of Work or designated portion thereof unless otherwise provided in Certificate of Substantial Completion.
3. The Certificate of Substantial Completion shall be submitted to Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. *

L. Owner may occupy Project, or designated portion thereof, under provisions agreed to in Certificate of Substantial Completion, and if required, a certificate of occupancy has been issued by governing authorities.

1. If Owner is going to occupy Project, or designated portion thereof, Contractor shall perform final cleaning immediately.
2. If Owner or Architect discovers any Work which is not complete and/or is not in conformance with Contract Documents, during or after occupying or utilizes Work, whether included on a list or not, Owner shall notify Contractor to complete or correct item(s) identified.

M. Contractor shall proceed expeditiously with adequate forces to complete or correct Work, and to complete all Project closeout requirements within designated time.

N. Upon completion of Work, employ Licensed Surveyor to make survey of site to assure conformance of elevations, grade and site work to contours shown. Provide letter of site conformance.

1.4 FINAL COMPLETION

A. After Contractor has completed all Work and has thoroughly inspected Work to determine that it is sufficiently complete, it is in general accordance with Contract Documents, and Contract is fully performed, Contractor shall submit Contractor's Certificate of Completion to Architect, and the list(s) of items to be completed or corrected initialed to indicate Contractor has verified completion of each item. * Utilize form at end of this section. Contractor certifies that:

1. Work has been thoroughly inspected by Contractor for compliance with Contract Documents.
2. Work has been completed in accordance with Contract Documents.
3. Equipment and systems have been tested and are operating satisfactorily.
4. Contract closeout requirements have been completed satisfactorily and submitted.
5. Contractor knows of no reason that insurance will not be renewable to cover period required by Contract Documents.
6. Work is ready for final inspection and acceptance.

B. Contractor submits final closeout submittals required by this and other Sections.

C. Owner Architect will make final walk through within a reasonable time after receipt of Contractor's Certificate of Completion and final Application for Payment. *

1. If Contractor prematurely submits a Contractor's Notice of Final Completion or requests Architect's final review of Project, and Architect determines that Project is not satisfactorily complete, Architect may invoice Owner as a change in services for such cost involved in evaluating and reviewing Work, and associated travel costs. Contractor shall reimburse Owner for such costs.

D. Contractor shall remedy any remaining deficiencies or incomplete Work, at Contractor's expense.

E. When Owner and Architect find Work acceptable under Contract Documents and Contract satisfactorily performed, Architect will promptly issue a final Certificate for Payment. *

F. Neither final payment nor any remaining retained percentage shall become due until Contractor submits to Architect the following:

1. an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with Work for which Owner or Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied (AIA Documents G706 and G706A),
2. a certificate evidencing that insurance required by Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to Owner,
3. a written statement that Contractor knows of no substantial reason that insurance will not be renewable to cover period required by Contract Documents,
4. consent of surety, if any, to final payment (AIA Document G707),
5. Contractor's and Subcontractor's final release or waiver of liens,
6. if required by Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of Contract, to extent and in such form as may be designated by Owner, for Owner's review, and
7. if a Subcontractor refuses to furnish a release or waiver required by Owner, Contractor may furnish a bond satisfactory to Owner to indemnify Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to Owner all money that Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees. *

G. If Substantial Completion or Final Completion is delayed through no fault of Owner or Architect, Architect may invoice Owner as a change in services for such costs, and associated travel costs. Contractor shall reimburse the Owner for such costs.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

CONTRACTOR'S NOTICE OF SUBSTANTIAL COMPLETION

PROJECT: _____

_____

ARCH PROJ. NO.: _____ CONTRACT DATE:

CONTRACT FOR: _____

WORK OR DESIGNATED PORTION SHALL INCLUDE: _____

_____

Work performed under this Contract has been thoroughly inspected and is considered to be sufficiently complete, in accordance with Contract Documents, so Owner can occupy or utilize Work or designated portion thereof for its intended use.

- ❑ Certificates of inspections indicating compliance with requirements of governing authorities, are attached hereto.
- ❑ Certificate of Occupancy have been obtained from governing authorities, are attached hereto.
- ❑ A comprehensive list of items to be completed or corrected, prepared by Contractor is attached, hereto. Failure to include any items on such list does not alter responsibility of Contractor to complete all Work in accordance with Contract Documents.

Contractor will complete or correct Work by: _____

CONTRACTOR: _____

BY: _____ DATE: _____

OWNER (agrees) (does not agree) to accept portion designated above separately from rest of Project.

Owner intends to utilize, occupy or take use on: _____

OWNER: _____

BY: _____ DATE: _____

The Work designated above, has been determined to be:

- ❑ Substantially Complete and a Certificate of Substantial Completion will be issued.
- ❑ Not substantially complete for following reasons: _____

_____

_____

_____

_____

ARCHITECT: HDR Architecture, Inc.

BY: _____ DATE: _____

DISTRIBUTION: ❑ OWNER ❑ ARCHITECT ❑ CONTRACTOR

END OF CONTRACTOR'S NOTICE OF SUBSTANTIAL COMPLETION

CONTRACTOR'S CERTIFICATE OF COMPLETION

PROJECT: _____
ARCH. PROJECT NUMBER: _____
CONTRACT FOR: _____
CONTRACT DATE: _____

This is to certify that I am an authorized official of, and have been properly authorized by said firm or corporation to certify following:
I know of my own personal knowledge, and do hereby certify on behalf of Contractor,
that Work has been reviewed and thoroughly inspected for compliance with Contract Documents,
that Work has been completed, in accordance with Contract Documents and Contract is fully performed,
that all equipment and systems have been tested and are operating satisfactorily,
that all Contract closeout requirements have been completed satisfactorily and submitted,
know of no substantial reason that insurance will not be renewable to cover period required by Contract Documents,
and Work is ready for final inspection and acceptance.

Attached are three (3) copies of following documents, which are required prior to final payment:

- ❑ Final Application for Payment.
- ❑ Contractor's Affidavit of Payments of Debts and Claims: AIA Document G706.
- ❑ Contractor's Affidavit of Release of Liens: AIA Document G706A.
- ❑ Contractor's Final Release or Waiver of Liens.
- ❑ Consent of Surety (if any) to Final Payment: AIA Document G707.
- ❑ Certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) days' prior written notice has been given to Owner.
- ❑ The list(s) of if items which were to be completed and corrected, with each item initialed to indicate Contractor has verified completion or correction of each.
- ❑ List of subcontractors and equipment suppliers.
- ❑ Certified list of all sales and service taxes paid.
- ❑ Letter of site conformance by licensed surveyor.
- ❑ If required by Owner, other data establishing payment or satisfaction of obligations arising out of Contract.
- ❑ Bond satisfactory to Owner to indemnify Owner against liens from Subcontractors.
- ❑ Transmittal indicating Owner has received Project Record Documents.

I understand that acceptance of final payment by Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at time of final Application for Payment.

CONTRACTOR: _____ BY: _____

TITLE: _____ DATE: _____

Subscribed and sworn to me this _____ day of _____ _____

NOTARY PUBLIC: _____

My commission expires: _____

DISTRIBUTION: ❑ OWNER ❑ ARCHITECT

END OF CONTRACTOR'S CERTIFICATE OF COMPLETION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUBMITTALS

A. Contract Closeout Information:

1. Operation and Maintenance Data.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE MANUALS

A. Assemble data indicated and data required to completely describe operation and maintenance procedures.

B. Assemble information in form of a multiple file composite electronic PDF file for each manual type required.

1. Index files by specification section, with each item clearly labeled.
2. Identify each volume with Project name and contents.
3. Identify each item in manner consistent with names and identification numbers used in Contract Documents, not with manufacturer's catalog numbers.
4. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

C. Use electronic files prepared by manufacturer where available.

1. Scan paper documents and configure scanned file for minimum readable file size.

D. Include each item on Table of Contents.

2.2 DATA REQUIRED FOR EQUIPMENT AND SYSTEMS

A. Sequence of Operation:

1. List valves, switches, etc., used to start, stop and adjust systems.
2. Provide flow diagrams, control sequences and valve directory.
3. Submit valve directory for review prior to inclusion in manual:
   a. Show valve number, location.
   b. List equipment controlled.

B. Lubrication Instructions:

1. Frequency of inspection and lubrication recommended.
2. Type of grease.
3. Amount of lubrication recommended.

C. Maintenance and Troubleshooting Data:

1. Manufacturer furnished data.
2. Project record wiring diagrams.
3. Name and address of manufacturer.
4. Name and address of local representatives who stock or distribute repair parts.

2.3 DATA REQUIRED FOR FINISH MATERIALS

A. Maintenance Data:

1. Precautions necessary.

2. Manufacturer’s instructions and recommendations.
3. Maintenance materials and tools required.
4. Repair and/or replacement instructions.
5. Name and address of manufacturer.
6. Name and address of local supplier of materials.

PART 3 - EXECUTION

3.1 DELIVERY

A. Deliver electronic copies to Owner sixty (60) days prior to Owner instruction of systems and equipment, and substantial completion.

B. Use Operation and Maintenance Data Transmittal form at end of this Section.

C. Acquire Owner’s acceptance of items listed on transmittal form.

D. Forward copy of transmittal form with Owner’s acceptance to Architect.

END OF SECTION

OPERATION AND MAINTENANCE DATA TRANSMITTAL

Project:

To Owner: **Date:**

From C.M./Contractor:

Assemble data required to describe operation and maintenance procedures. Deliver as an indexed electronic PDF file. Include name, address, and phone number of closest supplier for each item.

Section	Description	Quantity

Owner's Verification and Acceptance

Accepted by: _____ **Date:** _____

Forward copy of this transmittal to the Architect.

DISTRIBUTION: ☐ OWNER ☐ CONTRACTOR ☐ C. M. ☐ ARCHITECT

END OF TRANSMITTAL

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SECTION 01 78 36
WARRANTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Warranties specified in Divisions 02 through 48 Sections shall be in addition to and run concurrent with other warranties required by Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to the Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for the Owner.

B. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of Contract Documents.

C. Manufacturer’s Warranties:

1. Provide for products, equipment, systems, and installations required by Divisions 02 through 48 Sections of Contract Documents for duration indicated.
2. Where manufacturer’s standard warranties or guarantees or both expire before duration required by other Sections of Contract Documents, obtain and pay for extensions as part of Contract Price.

D. Special Warranties:

1. Refer to Divisions 02 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.
2. Provide written Special Warranties for products, equipment, systems, installations, and joint responsibilities as noted and required by Divisions 02 through 48 Sections of Contract Documents for duration indicated.
3. Prepare a written document that contains appropriate terms and identification, ready for execution.
    a. Modified and properly executed Manufacturer's standard form to include project specific information.
    b. Submit draft for approval before final execution.
        1) See Section 01 33 00.

E. Provide Warranties. Special Warranties and Guarantees prior to final payment.

1. Provide in electronic data format.
    a. Coordinate format with Owner.

F. Warranties. Special Warranties and Guarantees required by Contract Documents shall commence on date of Substantial Completion of Work unless otherwise indicated in Certificate of Substantial Completion.

1.2 SUBMITTALS

A. Contract Closeout Information:

1. Transmittal letter indicating Owner’s receipt of electronic data format containing product equipment and system warranties or guarantees or both required by other Sections of Contact Documents.

1.3 JOB CONDITIONS

A. If for any reason, Contractor cannot warrant or guarantee or both any portion of Work using products or construction methods indicated or required by other Sections of Contract

Documents, notify Architect in writing during bid period, and before contracts are awarded, indicating reasons and names of products and data on substitutions that can be warranted or guaranteed or both.

1. Should Contractor fail to notify Architect, Contractor will be considered as having agreed to warrant or guarantee the Work indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRODUCT, EQUIPMENT AND SYSTEM WARRANTIES AND GUARANTEES

A. Compile approved warranties and guarantees or both required by other Sections of Contract Documents.

1. Index by Section, with each warranty, guarantee, or both clearly labeled.
    a. Identify each volume with project name and contents.
2. Identify each warranty or guarantee or both in manner consistent with names and identification numbers used in Contract Documents.
3. Provide transmittal letter containing:
    a. Date
    b. Project title
    c. Contractor’s name and address
    d. Title and number of warranties, guarantees, or both.
    e. Indication of Owner’s receipt
4. Deliver to Owner prior to final payment with copy of transmittal letter indicating Owner’s receipt.

END OF SECTION

DIVISION 03

CONCRETE

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SECTION 03 05 00
CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Concrete, as indicated, in accordance with provisions of Contract Documents.

B. Coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. ASTM designated specifications for material quality and test methods appear throughout this specification.

B. Standards for concrete work: Comply with applicable provisions of latest editions of American Concrete Institute (ACI) publications except as otherwise indicated.

1. ACI 301 Specifications for Structural Concrete.
2. ACI 347R Guide to formwork for Concrete.
3. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. Concrete Mixture Proportioning:

1. Employ and pay for testing agency acceptable to Architect and Owner to perform materials evaluation, testing and design of concrete mixes.
2. Certificates, signed by material producer and Contractor, may be submitted in lieu of material testing when approved by Architect.

D. Concrete Testing:

1. Owner will employ a testing laboratory to perform routine testing and evaluation of concrete delivered to jobsite.
2. Contractor to assist with related communication and temporary storage of test cylinders at jobsite.

1.3 DEFINITIONS

A. Normal Weight Concrete:

1. Concrete for which density is not a controlled attribute.

B. Formwork:

1. Total system of support for freshly placed concrete including mold or sheathing which contacts concrete as well as supporting members, hardware, and necessary bracing.

C. Exposed Construction:

1. Concrete surface seen by the public from eye level from walking surface in a public location after completion of building.

D. Public Location:

1. Building areas routinely accessible to public and employees not responsible for maintenance.
    a. Storerooms, unfinished space and large mechanical rooms are considered public locations.
    b. Equipment closets, elevator and mechanical penthouses are not considered public space.

1.4 SUBMITTALS

A. Shop Drawings:

1. Reinforcing drawings showing sufficient detail to permit placement in the field without reference to Contract Drawings.

B. Product Data:

1. Concrete Mix Designs for each proposed concrete mix.
    a. Proportions of materials.
    b. Slump.
    c. Air content.
    d. 7-day and 28-day compression test results of trial mixes or standard deviation analysis of an established mix.
    e. Submit Concrete Mix Designs using the mix design submittal form included at the end of this specification.
2. Source and certification or proof of quality and compatibility of admixtures for each of the constituents of the proposed concrete mixes.
    a. Cement.
    b. Aggregate including gradation.
    c. Water.
    d. Admixtures:
        1) Air Entraining Admixture.
        2) High-Range Water Reducer.
        3) Fly Ash.
        4) Other.
3. Joint filler.
4. Curing compound.
    a. Interior slabs: Include floor covering manufacturer's written approval for use.

C. Samples:

1. Joint filler.

D. Project Information:

1. Production sample test reports:
    a. Include same data as required for mix design reports.
2. Reports of Contractor optional tests.
3. Test reports for in-place testing if such testing is performed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland Cement:

1. ASTM C150, Type I or Type III or ASTM C595.
2. Cement Color: Natural gray.

B. Aggregates:

1. General:
    a. Regard fine and coarse aggregates as separate ingredients.
    b. Each size of coarse aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of applicable ASTM specifications.
2. Normal Weight Concrete:

a. ASTM C33 – Standard Specification for Concrete Aggregates.
b. Aggregate approved by the local State Highway Department for use in concrete for state bridges.

C. Potable Water:
1. Conforming to ASTM C 1602.

D. Admixtures:
1. Use only when specifically required or permitted by Contract Documents, otherwise must be approved by Structural Engineer.
2. Prepare trial mixes and tests with job materials, including admixture, to demonstrate effect on strength and durability of hardened concrete.
3. Calcium chloride or admixtures containing more than 0.05% chloride ions are not permitted.
4. Air-entraining Admixtures:
a. ASTM C260.
5. Mid-Range Water Reducer:
a. ASTM C494, Type A.
6. High-Range Water Reducer:
a. ASTM C494, Type F or G.
b. Daracem – 100 or Adva Flow Series by Grace Construction Products.
c. MasterRheobuild 1000, MasterGlenium Series or PS 1466 by Master Builders Solutions.
d. Eucon 37 or Eucon SPJ by Euclid Chemical.
e. PSP-N, PSP-N2, PSP-R, and PSP-L by Procrete Industries.
7. Water-reducing, Retarding, and Accelerating Admixtures:
a. ASTM C494.
8. Supplementary Cementitious Materials, including Fly Ash:
a. Fly Ash:
1) ASTM C618, Class C or Class F.
2) Obtain, prepare and test samples in accordance with ASTM C311.
b. Ground Granulated Blast Furnace Slag:
1) ASTM C989, Grade 100 or 120.
9. Synthetic Macro Fibers
a. ASTM C1116 Type III
b. Fiber Reinforced concrete shall provide equivalent reinforcing to WWR indicated in both direct tension and bending capacity for thickness indicated
c. Testing per ASTM C1018 and/or ASTM C1399 shall indicate a minimum residual flexural strength of 170 psi. Submit manufacturers data verifying conformance
d. Minimum Dosage rate 1.5 pounds/CY.
e. Acceptable manufacturers
1) W.R. Grace Co, Strux 90/40
2) Euclid Chemical Company Tuf-Strand SF

E. Curing Compounds:
1. Strippable Curing Compound:
a. The compound shall conform to ASTM C309, VOC Compliant, 350 g/l.
1) For use on slabs receiving subsequent applied finishes and where noted on drawings.
2) Install in accordance with manufacturer’s recommendation and supervision.

b. Manufacturers:
1) Kurez DR VOX or Kurez W VOX
2) Horncure WB Horncure WB 30 by the Euclid Chemical Company.

2. Chemical Curing Compound:
a. Base:
1) L&M Construction Chemicals.
b. Optional:
1) Dayton Superior.
2) Euclid.
3) Sonneborn.
4) WR Meadows.

F. Granular Fill:
1. See Section 31 23 00.

G. Formwork Materials:
1. Exposed concrete surfaces: Acceptable panel type to provide continuous, straight, smooth finish. Use largest practical sizes to minimize form joints.
2. Unexposed concrete surfaces: Suitable material, dressed on edges and sides for tight fit.

H. Reinforcing Materials:
1. Reinforcing bars: ASTM A615, Grade 60
2. Welded wire reinforcing: ASTM A1064

2.2 PROPORTIONING CONCRETE MIXES

A. General:
1. Contractor and concrete supplier are responsible to provide concrete, in-place, which satisfies requirements listed in following table.
2. Contractor and concrete supplier are responsible to adjust concrete mixes, as needed, to:
a. Correct for non-conformance.
b. Correct for a variation in the quality of a constituent.
c. Compensate for extreme conditions in the field.

B. Establish concrete material proportions by proportioning methods described in ACI-301 guidelines.

Concrete Properties Table – IP Units							
Use	28-day Strength (KSI)	Dry Unit Weight (PCF)	Max Aggregate Size (IN)	Air percent	Max. W/C Ratio	Slump (IN)	Cement Type
Footings ,Grade Beams	4.5		1-1/2	4.5	0.60	4	I
Walls	4.0		1	4.5	0.50	5	I
Slabs-on-grade	4.0		1 1/2		0.45	3	I
All other uses	4.0		3/4	6	0.50	4	I

C. Instructions for use of Table:
1. Provide concrete mixes with properties indicated in locations identified in Use column.
2. 28-day Strength:

a. Installed concrete must meet or exceed the minimum 28-day compressive strength indicated.
b. Laboratory mix design strengths must exceed this strength by the appropriate amount per ACI 301.
c. Determine strength in accordance with ASTM C192 and ASTM C39.

3. Dry Unit Weight:
   a. If no value is listed, assume normal weight.
   b. Correlate fresh weight with air dry of same mix to use as basis of acceptance on job site. Test in accordance with ASTM C567.
4. Maximum Aggregate Size:
   a. Maximum size of coarse aggregate determined in accordance with:
      1) ASTM C33 for normal weight concrete.
   b. Some mixes are designated 3/4 inches or 1 inch, permitting contractor / supplier option.
5. Air Content:
   a. Required percentage of air as measured by ASTM C231, ASTM C173, or ASTM C138 as appropriate.
   b. Tolerance of air content as delivered is plus or minus 1-1/2% for normal weight and plus or minus 2% for lightweight concrete.
6. Water Reducer:
   a. Mid-range water-reducer or high-range water-reducer shall be provided as necessary to achieve slump indicated.
   b. Contractor, as option, may elect to use water reducers in other mixes to improve workability or permit pumping.
7. Maximum W/C Ratio:
   a. Maximum ratio of pounds of water to pounds of cementitious material allowed in the concrete mix.
8. Maximum Slump:
   a. Mixes without Water Reducers:
      1) Slump tolerance: Up to 1 inch above maximum indicated is allowed, provided the average of 5 consecutive batches does not exceed the indicated amount by more than a 1/2 inches.
   b. Mixes with Water Reducers:
      1) Slump indicated is after dosing.
      2) Slump tolerance after dosing: +1-1/2 inches and -1 inches is permitted for each batch.
      3) Slump tolerance prior to dosing: +1/2 inches and -1 inches from design mix slump.
   c. Determine slump in accordance with ASTM C143.
   d. Where slump is not specified, provide concrete with slump in accordance with approved mix designs.
9. Cement:
   a. Provide cement type indicated.
   b. Fly Ash or Ground Blast Furnace Slag is acceptable for partial replacement of cement.
      1) For each unit of cement removed, replace with two (2) units of Class F fly ash or one (1) unit of Class C fly ash.
      2) For each unit of cement that is removed, replace with one (1) unit of Ground Blast Furnace Slag
      3) Maximum amount of cement replaced shall not exceed that specified in table 4.2.2.9 of ACI 301.
      4) W/C Ratio shall be based on total cementitious material content.

D. Admixtures:

1. Use admixtures in accordance with manufacturer's instructions.
2. Use only approved admixtures.

PART 3 - EXECUTION

3.1 STORAGE OF MATERIALS

A. Store cement in weather tight buildings, bins, or silos which will exclude moisture and contaminants.

B. Arrange aggregate stockpiles and use in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of like aggregates.

1. Perform test to determine conformance to requirements for cleanliness and grading on samples secured from aggregates at point of batching.
2. Do not use frozen or partially frozen aggregates.

C. Allow sand to drain until it has reached relatively uniform moisture content before use.

D. Store admixtures in manner to avoid contamination, evaporation, or damage.

1. For those used in form of suspensions or non-stable solutions, provide agitating equipment to assure uniform distribution of ingredients.
2. Protect liquid admixtures from freezing and temperature changes which would adversely affect their characteristics.

3.2 MIXING AND DELIVERY

A. Batch, mix and transport concrete in accordance with ASTM C94/C94M.

B. Batch and mix admixtures in accordance with manufacturer's instructions. If two or more admixtures are used, verify compatibility with manufacturer.

C. When adding water at job site is planned, deliver concrete to job site with a slump of 2 to 4 inches.

1. Limit water additions at job site to comply with W/C Ratio requirements.

D. Following addition of high range water reducer, mix for a minimum of 70 revolutions or 5 minutes to assure a consistent mixture.

E. Reduction of required average strength:

1. During construction, and after sufficient data becomes available, laboratory strength of mixes may be reduced in accordance with Section 4.2.3.6a of ACI 301, subject to approval by the Architect.

3.3 FORMWORK AND REINFORCEMENT

A. Rough form finish may be provided for concrete surfaces covered with earth and not exposed to public view.

1. Ordinary form facing material may be used for rough form work.

B. Use smooth forms for interior and exterior concrete surfaces exposed to view.

1. Interior surfaces may be painted.
2. Use a plastic coated plywood or plastic liner to produce a hard, smooth uniform finish on concrete.
3. Arrange form joints and snap-tie holes to produce a repeating, orderly pattern with number of seams kept to practical minimum.
4. Seal seams to prevent leakage of mortar.
5. Support form facing with framing and backing capable of preventing visible form deflection.

C. Layout and measurement of concrete forms and embedment's, required for work, performed by a licensed surveyor, employed by contractor.

D. Clean, adjust and seal forms prior to concrete placement.

E. Remove excess form release materials to avoid visible residue on concrete surface.

F. Tighten forms to eliminate mortar leaks.

G. Accurately position, support and secure reinforcement and other cast-in items against displacement when placing concrete.

H. Locate and support with chairs, runners, spacers and hangers, as required.

I. Set wire ties so ends are directed into concrete.

J. Install welded wire reinforcement in maximum practicable sizes.

K. Lap sides and ends at least one mesh square plus 2 inches.

L. Place construction joints so as to not impair strength and appearance of structure in locations approved by Architect.

M. Set and build in anchorage devices and other embedded items required for other work that is attached to or supported by concrete.

N. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for its support, prior to concreting.

1. Give Contractors whose work is related to concrete or supported by it ample notice and opportunity to introduce and furnish embedded items before concrete placement.
2. Position expansion joint material, water stops, and other embedded items accurately and support against displacement.
3. Fill voids in sleeves, inserts and anchor slots temporarily with readily removable material to prevent entry of concrete.

O. Use setting diagrams, templates and instructions for locating and setting.

3.4 PLACING CONCRETE

A. Place concrete in compliance with recommendations of ACI 304.

B. Place in a continuous operation within planned joints or sections.

C. Begin placement when work of other trades affecting concrete is completed.

D. Consolidate concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into parts of forms.

E. Protect concrete from physical damage or reduced strength due to weather extremes.

1. In hot weather comply with recommendations of ACI 305.
2. In cold weather comply with ACI 306.

3.5 CURING

A. Begin curing as soon as free water has disappeared from exposed surfaces.

B. Keep moist for 72 hours.

C. Continue curing by use of moisture retaining cover or strippable membrane forming curing compound for a period of 14 days.

D. Cure formed surfaces by moist curing until forms are removed.

E. Provide protection as required to prevent damage to concrete.

3.6 PATCHING AND FINISHING

A. Rough form finish:

1. Patch defects and tie holes.
2. Chip or rub off fins exceeding 1/4 inches in height.
3. Leave surfaces with texture imparted by forms.

B. Smooth form finish:

1. Remove forms and perform following work on walls and beam sides within day after placement.
2. Unpainted surfaces:
    a. Perform work as outlined for painted surfaces. In addition, provide a smooth rubbed finish over entire concrete surface no later than a day following form removal.
    b. Wet surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced.
    c. Use no cement grout other than cement paste drawn from concrete itself by rubbing process.

C. Broom finish:

1. Immediately after concrete has received float finish, give it a course scored texture by drawing a broom across the surface of the concrete.
2. Finish concrete to maximum tolerance of 1:500.

3.7 CLEANING OF CONCRETE

A. Clean cast-in-place concrete walls which will remain exposed to view.

END OF SECTION

SECTION 03 08 13

CONCRETE TESTING AND EVALUATION - OWNER

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Concrete Testing and Evaluation - Owner, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. ASTM International (ASTM):

1. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in Field
2. ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
3. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

B. American Concrete Institute (ACI):

1. ACI 318 Building Code Requirements for Structural Concrete and Commentary

C. Testing Agency:

1. Acceptable to Architect.
2. Recent evidence of inspection by Cement and Concrete Reference Laboratory of National Institute of Standards and Technology, with cited deficiencies corrected.
3. Meet requirements of ASTM E329.
4. Agency and its representatives are not authorized to revoke, alter, relax, enlarge or release requirements, nor approve or accept portion of Contract Documents.

1.3 SUBMITTALS

A. Product Data:

1. For each type of material and accessory.

B. Project Information:

1. Testing Agency qualifications.
2. Production sample test reports, when required:
   a. Include same data as that required for mix designs.
3. Reports of Contractor option tests.
4. Test reports on in-place testing if such testing is performed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DESCRIPTION

A. Test concrete materials and inspect operations as work progresses.

B. Failure to detect defective work or material shall not prevent later rejection when such defect is discovered nor shall it obligate Architect for final acceptance.

C. Payment for Testing:

1. Pay for testing services required in paragraph Article 3.2, following.

2. Routine testing of concrete furnished to job site for compliance with Contract Documents will be performed by Owner's testing agency at Owner's expense.
    a. Test for compressive strength, slump, air content, temperature and unit weight.
    b. Perform tests every 75 CU YD or fraction thereof, for each mixture design placed in one day.
    c. Obtain composite samples in accordance with ASTM C172.
        1) Obtain each sample from a different batch of concrete on a random basis.
        2) Select test batch at random before commencement of concrete placement.
    d. Mold and cure sufficient specimens from each sample in accordance with ASTM C31 and report deviations from requirements, if any.
    e. Coordinate number of specimens with test specification requirements and construction operations.
    f. Test specimens in accordance with ASTM C39.

3.2 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

A. Provide testing services performed by Testing Agency for qualification of proposed materials and establishment of mix designs.

B. Submit concrete materials and concrete mix designs.

1. Include results of testing performed to qualify materials and establish mix designs

C. Place no concrete until Contractor has received approval.

D. Use of testing service shall not relieve Contractor of responsibility to furnish materials and construction in compliance with Contract Documents.

E. Testing and Inspection:

1. Furnish labor to assist Owner's Testing Agency in obtaining and handling samples or other materials at site.
2. Advise Owner's Testing Agency in advance of operations.
3. Provide and maintain facilities for storage and curing of concrete compressive strength test specimens on site for first 24 hours or until strength is achieved as required by ASTM C31.

F. Pay for following additional testing services performed by Owner's testing agency when:

1. When changes in materials or proportions are requested by Contractor Additional testing and inspection.
2. When specimens fail to meet specification requirements, by test or inspection.
3. Testing services needed or required by Contractor.
    a. Field-cured test specimens as needed for control of stripped, reshored, unshored, post-tensioned concrete work.

3.3 EVALUATION AND ACCEPTANCE OF COMPRESSIVE STRENGTH TEST RESULTS

A. Evaluate test results for standard molded and cured test cylinders separately for each concrete mix design.

1. Evaluate each mix design for strength and uniformity by a minimum of five tests.

B. Strength level of concrete shall be considered acceptable when average of three consecutive strength test sets equal or exceed specified strength (f'c) and no individual strength test result is less than specified strength (f'c) by more than 500 psi.

3.4 TESTING CONCRETE IN PLACE

A. Test concrete in place when compressive strength tests indicate potential strength deficiency to evaluate actual strength.

1. Pay for concrete tests and engineering time and analysis required to evaluate in-place concrete strength as result of deficient cylinder strength tests.

B. Testing by rebound hammer, ultrasonic, or other non-destructive device.

1. Tests shall be used to determine relative strengths at various locations in structure to determine areas to be cored.
2. Calibrated and correlated tests with other test data shall be used as basis for acceptance or rejection.

C. Core Tests:

1. Obtain and test largest practical diameter cores, 2 inches minimum, in accordance with ASTM C42.
    a. Test dry if concrete in structure will be dry under service conditions,
        1) Air dry cores at 60 deg F to 80 deg F, relative humidity less than 60 percent for 7 days before test.
    b. Test cores after moisture conditioning if concrete in structure is more than superficially wet under service conditions.
2. Take three cores from area of concrete or member considered deficient in strength.
    a. Location as selected by Architect.
    b. Replace cores damaged prior or during removal from structure prior to testing.
3. Concrete core test shall be considered acceptable if average strength of cores is equal to at least 85 percent of, with no single core less than 75 percent of specified strength (f'c).
4. Fill core holes with low slump patching compound per Section 03 05 00.

3.5 ACCEPTANCE OR REJECTION OF CAST-IN-PLACE CONCRETE

A. General:

1. Completed concrete work which conforms to requirements of Contract Documents will be accepted without qualification.
2. Concrete work which fails to conform to one or more requirements of Contract Documents shall be rejected and will not be accepted until repaired and proven adequate by concrete testing.
3. Contractor pays costs incurred in providing remedial work necessary to change rejected work to accepted work.
4. Remedial work includes, but is not necessarily limited to, applicable repairs, replacement, reinforcement, engineering, and testing.
5. Repair or replacement of concrete in an approved manner and in conformance with Contract Documents constitutes acceptance.

B. Dimensional Tolerances:

1. Formed surfaces resulting in concrete outlines smaller than permitted by tolerances shall be considered potentially deficient in strength and subject to confirmation of safety by structural analysis or load test.
    a. When deficiencies are confirmed, replace or reinforce structure as directed.
2. Formed surfaces resulting in concrete outlines larger than permitted by tolerances will be rejected if strength or finish of structure is not acceptable, or function is adversely affected.
    a. If removal of excess material is permitted, repair of surfaces constitutes acceptance.
    b. If removal of excess material is not permitted, replacement of surfaces constitute acceptance.
3. Concrete members cast in wrong location will be rejected if: strength or finish is not acceptable, function is adversely affected, and /or interference is encountered with other construction.
4. Inaccurately formed concrete surfaces exceeding tolerances and exposed to view will be rejected.

C. Finish:

1. Architectural concrete with surface exceeding limitations will be rejected.
2. Concrete exposed to view with defects which adversely affect appearance of specified finish may be repaired only by approved methods.
3. Slabs:
    a. Finished slabs exceeding tolerance limits specified in Section 03 05 00 will be rejected if finish is not acceptable and function is adversely affected.
        1) If rejected, repair of finished surfaces or replacement of slab in an approved manner and in conformance with Contract Documents will constitute acceptance.
    b. Repair may involve removing high spots by grinding, filling low spots with patching compound, or remedial measures as permitted.
4. Formed surfaces:
    a. Concrete exposed to view with defects which adversely affect appearance of specified finish will be rejected.
        1) Repair surface defects in conformance with Section 03 05 00.
5. Concrete not exposed to view is not subject to rejection for defective finish.

D. Strength of Structure:

1. Concrete in place which control strength of structure will be rejected if it fails to comply with requirements of Contract Documents, including but not necessarily limited to:
    a. Deficient concrete strength based on compressive strength tests.
    b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with requirements on reinforcement.
    c. Concrete which differs from required dimensions or location.
    d. Curing less than that specified.
    e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
    f. Mechanical injury, construction fires, accidents or premature removal of formwork.
    g. Substandard workmanship.
2. When strength of structure is considered potentially deficient, it will not be accepted until one of following is completed and submitted to Architect for approval prior to action by Contractor.
    a. Confirmation of safety of structure by structural analysis.
    b. Core tests shall be performed only when safety of structure is not confirmed by structural analysis.
    c. Confirmation of safety of structure by load tests performed and evaluated in accordance with ACI 318.
    d. Replacement of structure deficient in strength.
    e. Reinforce structure with supplement supports as directed by Architect and approved by Owner.

END OF SECTION

DIVISION 05

METALS

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Miscellaneous Metal Fabrications, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. ASTM International (ASTM):
   a. ASTM A36 Standard Specification for Carbon Structural Steel
   b. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   c. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   d. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 psi Tensile Strength
   e. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
   f. ASTM A354 Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
   g. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   h. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   i. ASTM A992 Standard Specification for Structural Steel Shapes
2. American Society of Mechanical Engineers (ASME):
   a. ANSI/ASME-A17.1 Handbook on Safety Code for Elevators and Escalators
3. American Institute of Steel Construction (AISC)
   a. Steel Construction Manual
4. American Iron and Steel Institute (AISI):
   a. Specification for the Design of Cold-Formed Steel Structural Members.
5. American Welding Society (AWS):
   a. ANSI/AWS C1.1M/C1.1 Recommended Practices for Resistance Welding
   b. ANSI/AWS D1.1 Structural Welding Code - Steel.
   c. ANSI/AWS D1.3 Structural Welding Code - Sheet Steel.
6. National Association of Architectural Metals Manufacturers (NAAMM):
   a. Class 1, Architectural, per NAAMM AMP-555, Code of Standard Practice for the Architectural Industry.
7. Occupational Safety and Health Administration (OSHA):
   a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.

B. Provide Miscellaneous Metals Fabrications engineered to support dead, live, and lateral (wind or seismic) loads where indicated or required by code.

1. Include headers and reinforcing members around openings.

2. Required details defining method of fastening throughout system and attachments to supporting primary structure included in engineering requirement.

1.3 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of material and accessory.
2. Shop Drawings:
   a. Plans and elevations showing members and connections.
   b. Anchors and accessory items.

B. Informational Submittals:

1. Structural calculations for Miscellaneous Metals Fabrications indicating design conforms to specified design criteria, sealed by the delegated design Structural Engineer.
   a. Submit concurrent with Shop Drawings.
   b. Engineer must be licensed in Nebraska.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Materials Listed:

1. Base: As noted.

B. Galvanizing Repair Paint:

1. Base:
   a. Tnemec.
2. Optional:
   a. ZRC Worldwide.
   b. Sherwin-Williams.

C. Shop Primer:

1. Base:
   a. As recommended by finish coat manufacturer for substrate.
2. Optional:
   a. Sherwin-Williams.
   b. Tnemec.

D. Non-shrink Grout:

1. Base:
   a. Dayton Superior Corporation.
2. Optional:
   a. Sauereisen.
   b. CGM Building Products.

E. Decorative Bollard Covers:

1. Base:
   a. Post Guard.

F. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Structural Steel:

1. Structural W and T shapes: ASTM A992, 50KSI yield point.

2. Other steel shapes and plate: ASTM A36.
3. Pipe: ASTM A53 Grade B.
4. Tubing: ASTM A500, Grade B, 46KSI minimum.

B. Bolts:

1. ASTM A307, ASTM A325, ASTM A354.

C. Filler Metal:

1. AWS Standards.

D. Fasteners:

1. Galvanized or stainless where built into exterior walls.
2. Select fasteners for type, grade and class required.
3. Bolts and Nuts: Regular hexagon head ASTM A307, Grade A.
4. Lag Bolts: Square or octagonal head type.
5. Machine Screws: Zinc-Nickel plated steel.
6. Wood Screws: Flat head carbon steel.
7. Plain Washers: Round carbon steel.
8. Lock Washers: Helical spring carbon steel.

E. Non-shrink Grout:

1. Compressive strength: 9000 psi 62 MPa at 7 days.
2. Base Product: 1107 Advantage Grout by Dayton Superior.

F. Metal Stairs:

1. Treads: Grating as specified.
   a. Provide integral corrugated non-slip nosing.
2. Risers:
   a. Grating treads:
      1) Solid plate welded to trailing edge of tread or landing.
      2) Minimum 3/16 inches thick by 4 inches high.
   b. Checkered plate treads: Solid checkered plate riser integral with tread.
3. Landings:
   a. Grating as specified.
   b. Provide integral corrugated non-slip nosing at edge acting as stair tread/nosing.
4. Design live load for landing platform and supporting structure:
   a. 100 PSF, uniform load.
   b. 300 LBS concentrated load on 4 inches square area.
   c. All components to be adequate for the uniform load or the concentrated load, whichever requires the stronger component.
   d. Maximum deflection: 1/300 of span under a superimposed live load of 100 psf.
5. Design, fabricate, and install in compliance with NAAMM and applicable codes.
   a. NAAMM AMP 510:
      1) Interior or exterior at buildings: Service Class.
6. Handrails and guardrails: Sch 40 pipe.
7. Material:
   a. Steel: ASTM A36, galvanized after fabrication

2.3 FABRICATION

A. Form to shapes indicated with straight lines, sharp angles, and smooth curves.

B. Shop-fabricate in as large assemblies as practicable.

C. Anchorage Accessories:

1. Items required securing wood to metal, wood to masonry, metals to masonry or concrete, metal to metal or metal to other items.

D. Drill or punch holes with smooth edges for temporary field connections and attachment of work by other trades.

1. Conceal fastenings where practicable.

E. Make permanent shop and field connections with continuous fillet type welds.

1. Grind exposed welds smooth.

F. Supply items required to complete construction and installation.

G. Meet requirements specified under Structural Steel for fabricating items of structural nature or use.

2.4 FINISHES

A. Items not to receive coatings:

1. Surfaces scheduled to be fireproofed with spray-on material.
2. Machined surfaces.
3. Surfaces adjacent to field welds.
4. Contact surfaces of bolt connections at slip connections.

B. Hot-dip Galvanized (HDG) Coating for Exterior Items:

1. Galvanize (HDG) the following items:
   a. Items to be installed on site, roof or other areas that are outside of building enclosure walls. This shall include items attached to exterior walls of building.
   b. Partial listing of items to receive HDG:
      1) Pipe Bollards.
      2) Stairs, and railings.
      3) Gratings and substructure.
      4) Exterior equipment supports.
      5) Similar items which are exposed to weather or built-in to Exterior walls.
      6) Other items indicated.
2. Clean thoroughly before galvanizing.
3. Galvanize in accordance with ASTM A123.

C. Galvanizing Repair Coating:

1. Tnemec Series 94-H20 Hydro-Zinc.
2. ZRC Worldwide, Galvilite 221.
3. Sherwin Williams Zinc Clad III HS 100.

2.5 METAL FABRICATIONS

A. Metal Gratings:

1. Complying with NAAMM Metal Bar Grating Manual.
2. Material and thickness (except were otherwise indicated):
   a. Galvanized steel, nominal 1-1/2 inches 38 mm thick.
3. Load capacity: Support minimum uniform load of 200 psf 10 kPa.
4. Provide hold down clips.
5. Furnish with frames and support items of comparable material and finish.

B. Steel Support Angles, Support Frames, and Loose Lintel Steel Members:

1. ASTM A36 steel, sizes and configurations as indicated.
2. Items to be hot dip galvanized:
   a. Items to be permanently exposed to weather, high humidity, or wet conditions.
   b. Items set into exterior walls.
3. Shop prime interior items not required to be galvanized.

C. Miscellaneous Equipment Supports:

1. ASTM A36 steel, Sizes and configurations as indicated.
2. Examples of items included:
   a. Other miscellaneous support items as indicated.
3. Items to be hot dipped galvanized:
   a. Items to be permanently exposed to weather, high-humidity, or wet conditions.
   b. Items set into exterior walls.

D. Bollards:

1. Provide where indicated.
2. Supply items required to complete construction and installation.
3. Minimum Workmanship Standards (unless noted otherwise): Class 1, Architectural, per NAAMM AMP-555, Code of Standard Practice for the Architectural Industry.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify suitability of substrate to accept installation.

B. Installation constitutes acceptance of responsibility for performance.

C. Verify wall backing has been installed for wall-mounted items specified in this Section.

3.2 INSTALLATION

A. General:

1. Set work level, true to line, plumb.
2. Weld field connections and grind smooth.
3. Conceal fastenings where practical.
4. Secure metal to wood with lag screws of adequate size with appropriate washers.
5. Secure metal to concrete with embedded anchors, setting compounds, caulking and sleeves, or setting grout.
   a. Use expansion bolts, toggle bolts, or screws for light duty service.
6. Meet structural requirements for erecting items of structural nature.
7. Do not field splice fabricated items unless size requires splicing.
8. Weld splices.
9. Provide fabricated items complete with attachment devices as required to install.

B. Galvanic Repair:

1. After galvanized units have been erected and anchored apply galvanizing repair paint in accordance with manufacturer’s recommendations.
2. Surface preparation: Remove contaminates in accordance with SSPC SP-1.

C. Bollards:

1. Direct buried:

a. Hole Depth: 6 inches 150 mm deeper than embedment length specified for bollard.
b. Hole Diameter: 24-inch 600 mm diameter for 6-inch 150 mm diameter bollard.
c. Set bollards plumb and to the exposure height indicated.

2. Surface bolted and other means of attachment: Install as detailed.
3. Fill annular space with concrete fill having a compressive strength of at least 3000 psi 20.7 MPa.
4. Paint or cover with decorative sleeves as scheduled.

3.3 TOUCH-UP AND REPAIR

A. Verify installations are neat and flush in appearance, and that there are no burrs, projections, or defects on exposed surfaces that might snag fingers or clothing. Correct deficiencies.

B. Touch-up damage to powder coat finishes in manner satisfactory to Architect.

C. Galvanic Repair:

1. After galvanized units have been erected and anchored apply galvanizing repair paint in accordance with manufacturer's recommendations.
2. Surface Preparation: Remove contaminates in accordance with SSPC SP-1.

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

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SECTION 07 92 13
EXTERIOR JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Exterior Joint Sealants, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Caulk and Caulking are synonymous with sealant work.

B. Paving Joints include joints in floor slabs, sidewalks, steps, ramps, and curbs.

C. Seal joints which would otherwise permit penetration of moisture or air, unless sealant work is specifically required under other Section.

D. Provide sealant at following locations:

1. Flashing reglets and retainers.
2. Exterior wall joints.
3. Masonry control joints, and between masonry and other materials.
4. Isolation joints.
5. Joints between paving or sidewalks and building.
6. Joints at penetrations of walls, floors, and decks by piping and other services and equipment not requiring firestopping.
7. Perimeters of door and window frames, louvers, grilles, etc.
8. Joints between dissimilar materials, to provide visually acceptable closures.
9. Solidly bed thresholds at exterior doors.
10. Other joints where caulking, or sealant is indicated.

E. Related materials specified elsewhere:

F. ASTM International (ASTM):

1. ASTM C510 Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants
2. ASTM C920 Standard Specification for Elastomeric Joint Sealants
3. ASTM C1193 Standard Guide for Use of Joint Sealants

G. Staining Potential of adjacent materials caused by sealants:

1. Pre-test proposed sealants where sealants are used with any of following materials:
   a. Brick Masonry.
   b. Manufactured Stone Masonry.
   c. Concrete Masonry.
2. Test Method: ASTM C1248 Standard Test Method for Staining of Porous Substrate by Joint Sealants.
3. Historical testing using same materials and cataloged by sealant manufacturer will be considered acceptable.
4. Where testing suggests that staining potential exists: Reselect sealant and retest.
5. Certify that staining potential has been evaluated.

1.3 SUBMITTALS

A. Shop Drawings:

1. Sealant Schedule with the following information:
    a. General description of locations requiring sealants (i.e. Brick to Aluminum Window).
    b. List type of sealant and name of product proposed for each location.
    c. Include a blank Color Column on schedule for selection.
    d. Architect to complete Color Column upon selection from submitted samples.

B. Product Data:

1. Performance characteristics and limitations.
2. Recommended installation.

C. Samples:

1. Cured sample of each color. Submit with Sealant Schedule.

D. Contract Closeout Information:

1. Field Quality Control Test and Inspection Reports.
2. Warranty.

1.4 WARRANTY

A. Provide written warranty that sealant work will remain free of defects for a period of 3 years from Date of Substantial Completion:

1. Failure of water or air tightness constitutes defect.
2. Loss of adhesion, cohesion, or failure to cure constitutes defect.
3. Remove defective work and materials and replace with new work and materials.
4. Non- prorated warranty to include labor and material.
5. Warranty signed by Installer, Contractor, or both.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Silicone Sealant:

1. Base:
    a. Pecora Corporation.
2. Optional:
    a. Dow.
    b. GE Silicone by Momentive Performance Materials.
    c. Sika Corporation.
    d. Tremco.

B. Polyurethane Sealants:

1. Base:
    a. Pecora Corporation.
2. Optional:
    a. Master Builders Solutions.
    b. Sika Corporation.

C. Silane-Modified Polymer Sealant (STPE, STPU, Polyurea):

1. Base:
    a. Pecora Corporation.

2. Optional:
    a. Master Builders Solutions.
    b. Tremco.

D. Other Sealants:

1. Base: As indicated.

E. Pre-molded Compressible Sealant:

1. Base:
    a. Emseal.
2. Optional:
    a. Master Builders Solutions.
    b. Construction Specialties.
    c. Erie Metal Specialties.
    d. Nystrom.
    e. Willseal by Tremco.

2.2 MATERIALS

A. Elastomeric Sealants:

1. ASTM C920 Type S or M, Grade-NS at vertical joints, Grade-P or –NS at horizontal joints, minimum Class as scheduled.
2. Non-staining sealant complying with ASTM C1248.
3. Where sealant is not exposed to view, use manufacturer's standard color which has best performance.
4. Before use of sealant, investigate its compatibility with surfaces, fillers, and other materials in joint system.
5. Refer to Sealant Selection Guide for Base Products.
6. Comply with lowest VOC limits as required by local laws and sustainable design requirements, if any.
7. VOC content no greater than 250 g/L.

13 mm32 mm	5 mm
0 mm	5 mm
45 mm255 mm	65 mm
5 mm	0 mm
0 mm0 mm	0 mm

B. Pre-molded Compressible Sealant:

1. Foam backing: Multiple layers of acrylic-impregnated, expanding foam sealant and closed-cell (EVA) foam.
2. Weather Facing: Low-modulus silicone with bellows profile.
3. Movement capability: +/-50% movement, 100% total.
4. Material to be sized appropriately for joint widths indicated.
5. Select color from manufacturer's standard line.
6. Base Product: Seismic ColorSeal by Emseal.

C. Compressible Backer:

1. Foam backing with multiple layers of acrylic-impregnated, expanding foam sealant.
2. Provide behind conventional backer-rod and sealant where indicated.
3. Movement capability: +/- 25% movement, 50% total.

4. Material to be sized appropriately for joint widths indicated.
5. Base Product: Backerseal by Emseal.

D. Installation Adhesive:

1. As recommended by manufacturer of compressible sealants and backers.
2. Comply with VOC limits as required by local laws.

E. Joint Primer:

1. As recommended by sealant manufacturer.
2. Sealant primers for nonporous surfaces as recommended by manufacturer with a VOC content no greater than 250 g/L.
3. Sealant primers for porous surfaces as recommended by manufacturer with a VOC content no greater than 775 g/L.

F. Backer Rod:

1. Polyethylene, polyethylene jacketed polyurethane foam, flexible, non-absorbent, non-bituminous material recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation of joint sealants under following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F 4.4 degrees C.
2. When joint substrates are wet.

B. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Apply only to joints free of material which may inhibit bond.

D. Apply to cementitious materials only when thoroughly cured and dry.

3.2 PREPARATION

A. Clean joints and prime as required by sealant manufacturer.

B. Install sealant after finish coating or covering is scheduled to be applied.

C. Limit application to surfaces to receive sealants and mask edges of joints to protect adjacent surfaces.

3.3 INSTALLATION

A. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Control joint depth.
2. Break bond of sealant at bottom of joint.
3. Provide proper shape of sealant.
4. Do not leave gaps between ends of sealant backings.
5. Do not stretch, twist, puncture, or tear sealant backings.
6. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

B. Make depth of sealant not more than one-half width of joint, but not less than 1/4 inches 6 mm.

C. Sub-caulk joints without suitable backstop, to proper depth.

D. Install correctly sized backer rods.

E. Apply bond breaker as required or recommended by sealant manufacturer.

F. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

G. Make joints watertight and airtight.

H. Install sealants using proven techniques that comply with the following and at same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

I. Tooling of Non-sag Sealants:

1. Tool immediately after sealant application and before skinning or curing begins, to form smooth, uniform beads, eliminate air pockets, and ensure contact and adhesion of sealant with sides of joint.
2. Remove excess sealant adjacent to joints as the Work progresses with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
3. Use tooling agents that are approved by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
4. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.

J. At traffic joints, slightly recess sealant to avoid direct contact with wheeled traffic.

3.4 SEALANT USAGE GUIDELINES

Guide to Sealant Types - Exterior				
Location	Materials	Sealant Type	Base Product	Remarks / Exceptions
General Exterior	Cast in Place Concrete Brick and Concrete Masonry Portland Cement Plaster Hollow Metal Door and Window Perimeters	Multi-part Polyurethane, chemically curing, epoxidized	Pecora Dynatrol II	Exception: Use Dymonic where used as bedding sealant for frames, sills, thresholds etc.
	Aluminum Composite Panels (ACM) and Metal Column Covers Joints in materials with high coefficients of linear expansion Weatherseals of Aluminum Window Frames (including perimeter joints)	Silane-Modified Polymer (STPU, STPE, Polyurea)	Pecora Dynatrol I-XL Hybrid	--
	Precast Concrete Panels EIFS Systems	Silicone or Silyl Terminated Polyether (STPE)	Pecora 890NST or 890FTS or Pecora Dynatrol I-XL Hybrid	--
	Stone Work	Silicone or Silane-Modified Polymer (STPU, STPE, Polyurea)	Pecora 864NST or Pecora Dynatrol I-XL Hybrid	Exception: Pre-test for staining potential per ASTM C1248, with stain-sensitive stone Note: Silane-modified Polyurethane will not stain.
	General Exterior Glazing	Silicone; Neutral-cure	Pecora 895NST	Exception: Select alternate silicone sealant types as appropriate for specific glazing application.

	Butt Glazing and Structural Silicone Joints	Silicone; 1-part, Neutral-cure	Pecora 895NST	--
	Fabrication of Insulating Glass Units (IGU)	Primary Seal: Polyisobutylene	Select high quality sealants, of basic type listed, as appropriate for specific application.	
		Secondary Seal: Silicone	Dowsil 982	--
	Zone dams, shear blocks and other internal component of Aluminum Window Systems	Silicone	Use product which offers optimal adhesion and performance for application.	
	Sheet Metal Gutters, Downspouts, Scuppers, etc	Butyl Rubber	Pecora BC-158	--
	Existing joints where Silicone was previously used	Silicone	Use product which offers optimal adhesion and performance for condition, and which offers suitable color choices for matching.	
Exterior Flatwork	Concrete Paving and Parking Structures	Multi-part Polyurethane	Pecora Dynatred	Pecora DynaTred is rated for continual water emersion. Others may not be.
	Concrete Walks			
	Brick Paving and Walks			
	Stone and Precast Plazas			

Notes

1. The above is intended to be an overall guide. Additional conditions and materials may be required. Notify Architect if additional Guidance is required to select unlisted items.
2. Optional sealant products shall offer same number of color choices as the Base Product listed or custom color matching.
3. All of the conditions and materials listed may not apply to subject project.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   a. Extent of Testing: Test completed, and cured sealant joints as follows:
      1) Perform 10 tests for the first 1000 ft. (300 m) of joint length for each kind of sealant and joint substrate.
      2) Perform one test for each 1000 ft. (300 m) of joint length thereafter or one test per each floor per elevation.
   b. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   c. Inspect tested joints and report on the following:
      1) Whether sealants filled joint cavities and are free of voids.
      2) Whether sealant dimensions and configurations comply with specified requirements.
      3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
   d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
   e. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
2. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other

requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

B. Prepare test and inspection reports.

END OF SECTION

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DIVISION 08

OPENINGS

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SECTION 08 11 13
HOLLOW METAL (HM) DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Hollow Metal Doors and Frames in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. ASTM International (ASTM):

1. ASTM A568 Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled

B. Hollow Door and Frame Standards:

1. ANSI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors
2. ANSI A250.8 / SDI 100 Recommended Specifications for Standard Steel Doors and Frames
3. ANSI A250.11 Recommended Erection Instructions for Steel Frames

1.3 SUBMITTALS

A. Shop Drawings:

1. Use same reference numbers for openings as those in Door and Frame Schedule in Drawings
2. Indicate door elevations, gauges; frame configuration; anchor types and spacing; location of reinforcement and preparations for hardware, including items recessed within door edges; details of moldings, removable stops, glazing and louvers; details of conduit and preparations for power, signal, and control systems.

B. Product Data:

1. Include construction details, material descriptions, core descriptions and finishes.
2. Shop primer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Base:
   a. Ceco Door Products
2. Optional:
   a. Curries
   b. Philipp Manufacturing Company
   c. Republic Doors and Frames
   d. Steelcraft Manufacturing

B. Galvanizing Repair Coating:

1. Base:
   a. Tnemec
2. Optional:

a. ZRC Worldwide
b. Sherwin Williams

C. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Steel Sheet and Strip:

1. Comply with ASTM A568.

B. Corrosion Resistant Coating:

1. Hot dip galvannealed: A60 per ASTM A653.
2. Minimum zinc-iron alloy coating: 0.6 oz/FT2 183 g/m2.
3. Provide corrosion resistant coating at door and frame:
   a. Openings located in an exterior wall.

C. Galvanizing Repair Coating:

1. Galvanized coating repair.
2. VOC 250 g/L maximum.

D. Hollow Metal Doors:

1. Comply with ANSI/SDI A250.8.
2. Determination of performance level for each door:
   a. Use level of HM door indicated for its location, size, and other listed criteria.

Schedule of HM Door Levels

Location	Additional Criteria	HMMA Level	Miscellaneous
Exterior Doors [1] (flush)	Openings where each leaf is less than 47 inches	Level 3 (Extra Heavy duty)	Galvanized / galvannealed
	Openings where one or more of the leaves exceeds 47 inches	Level 4 (Maximum-duty)	

Notes
Refer to Door Schedule for indication of the Door Type (I.e. Width, Fire Rating, Flush vs. Stile & Rail, etc.)
Refer to Plans for door location (Exterior vs. Interior).
Not all items included in table may apply to subject project.

Footnotes
1. Refer to Part 2.2 MATERIALS for definition of Exterior locations.

3. Door Thickness: 1-3/4 inches 45 mm.
4. ANSI A250.8 Level 4, Maximum duty, physical performance Level A.
   a. Face Sheet Thickness: 0.067 inches (14 GA) 1.7 mm.
5. ANSI A250.8 Level 3, Extra Heavy duty, physical performance Level A.
   a. Face Sheet Thickness: 0.053 inches (16 GA) 1.3 mm.
6. ANSI A250.8 Model 2, Seamless.
7. End closures at top and bottom of door:
   a. Top: Flush closure top cap. Minimum Sheet thickness: 0.032 inches (20 GA) 0.8 mm.
   b. Bottom: Flush closure. Minimum Sheet thickness: 0.032 inches (20 GA) 0.8 mm.
   c. Bottom: Inverted channel. Minimum Sheet thickness: 0.053 inches (16 GA) 1.3 mm.
8. Vertical door edges:
   a. Lock Stile Edges: Beveled 1/8 inches 3 mm per 2 inches 50 mm.

1) Exception for inactive leaves: Fabricate inactive leaves with a square edge at the lock stile edge. Active leaves to be beveled per above.
2) Hinge Stiles Edge: Beveled 1/8 inches 3 mm per 2 inches 50 mm.
3) Exceptions for Double Acting Doors: Provide convex, radiused edges at lock stiles and hinge stiles.

9. Hardware Reinforcement (doors):
   a. Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as door face sheets.
   b. Minimum thickness: As prescribed in ANSI/SDI A250.6; Upgrade as necessary for conditions such as door weight, size, frequency, etc. and as follows:
   c. Butt Hinges: 0.167 inches (7 GA) 4 mm plate reinforcement or continuous 0.104 inches (12 GA) 2.6 mm channel engineered for equal strength.
   d. Continuous hinges: Reinforce with 0.067 inches (14 GA) 4 mm thick x 1-1/4 inches 32 mm wide strapping extending full height and welded to hinge edge of door.
   e. Closers and Overhead Stops: 0.067 inches (14 GA) 4 mm.
10. Cores:
   a. Steel stiffeners where structurally required.
   b. Exterior Doors:
      1) Non-rated doors: Kraft honeycomb laminated to face sheets.
      2) Moisture resistant materials.
   c. Specific materials used for above listed core types: Manufacturer's option.
   d. Reinforce for Hardware.

E. Hollow Metal (HM) Frames:

1. Comply with ANSI/SDI A250.8 and with details indicated for type and profile in accordance with SDI 111.
2. Fabricate frames with mitered or coped corners and 1/2 inches 13 mm nominal backbend.
   a. Touch-up galvanized/galvannealed frames with zinc-rich primer.
3. Fabricate frames as Face Welded (modified ANSI definition):
   a. Face Joints: Continuously back weld face joints (weld on concealed side).
      1) Fill and finish exposed sides to be free of visible seams.
   b. Intersections of Rabbets, Stops and Soffit Joints: Fabricate to hairline joints. Stitch weld on concealed side.
   c. Split type frames and knock down type frames are not acceptable.
   d. Fasteners which are exposed to view are not acceptable.
4. Fabricate frames as Knocked Down type.
5. Provide minimum steel gauge as indicated for its location, size and other listed criteria per following schedule.

Schedule of HM Frames			
Location	Criteria	Minimum Thickness	Miscellaneous
Exterior Frames [1]	Standard	0.067 inches (14 GA)	Galvanized / galvannealed

Notes
Gauge of frame listed is the minimum. Use heavier gauge as required due to size, physical configuration or if required to meet fire label requirements.
Refer to Door Schedule for indication of the Frame Type (I.e. Width, Single vs. Pair; Fire Rating, etc)
Refer to Plans for door location (Exterior vs. Interior).

Where Hurricane or Tornado resistant openings are specified: Refer to ADDITIONAL REQUIREMENTS for appropriate door/frame construction.
Some items listed may not apply to subject project.

Footnotes
1. Refer to Part 2.2 for definition of Exterior locations.
2. Refer to Part 2.2 for definition of Wet/Humid locations.

F. Silencers:
   1. ANSI/BHMA 156.16
      a. Diameter: 1/2 inches.
      b. Projection: 1/8 inches.
      c. Tamper-proof.
      d. Base Product – Steel Frames: SR64 by Ives.
      e. Base Product – Wood Frames: SR65 by Ives.
   2. Quantity:
      a. Three on strike jamb of single frames.
   3. Space per manufacturer's recommendations.

G. Hardware Reinforcement:
   1. Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
   2. Minimum thickness: As prescribed in ANSI/SDI A250.6; upgrade as necessary for conditions such as door weight, size, frequency, etc. and as follows:
      a. Butt Hinges: 7 GA.
      b. Continuous hinges: Reinforce with 0.067 inches (14 GA) 1.7 mm thick x 1-1/4 inches 32 mm wide strapping extending full height and welded to hinge jamb door rabbet of frame.
      c. Closers and Overhead Stops: 0.093 inches (12 GA) 2.4 mm thick x 12 inches 305 mm long strapping welded to vertical flange of frame.

H. Jamb Anchors:
   1. ASTM A879 Commercial Steel, 4 oz/SF coating; mill phosphatized.
      a. Frames in exterior walls:
         1) Steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.
   2. Provide anchors in accordance with manufacturer's recommendations on fire rated doors.
   3. Provide minimum number as indicated in following table:

Minimum Quantity of Jamb Anchors	
Nominal Frame Height	Minimum Quantity per Jamb
60 inches to 90 inches 1.5 M to 2.3 M	3

      a. Jamb anchors for stud framed walls:
         1) Z-shaped clips, welded to inside of frames; not less than 0.042 inches (18 GA) 1 mm thick, or compression anchors to suit frame size.
         2) Attach anchors to studs with screws.
      b. Floor Anchors:
         1) Same for Jamb Anchors but not less than 0.053 inches (12 GA) 2.4 mm thick.
            a) Anchors built into exterior walls:

(1) Steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.

b) Monolithic concrete slabs:

(1) Clip type anchors, with two holes to receive fasteners.

2) Include concealed fasteners.

3) Provide anchors in accordance with manufacturer's recommendations at fire rated openings.

4. Spreaders:
   a. Provide removable spreaders at bottom of door frames.
5. Inserts, bolts and fasteners:
   a. Manufacturer's standard units
   b. Galvanize items built into exterior walls ASTM A153, Class C or D as applicable.

2.3 FABRICATION

A. Factory fit doors to frame openings with uniform clearances in accordance with:

1. National Fire Protection Association NFPA 80 for fire rated doors.
2. National Fire Protection Association NFPA 105 for smoke control doors.
3. American National Standards Institute ANSI A250.8.
4. Locally adopted Building Code.
5. Steel Door Institute SDI 117.

Door To Frame Clearances		
Location		Clearance
Door to Frame at top and sides		1/8 inches
Face of door to face of Stop		1/8 inches
Door Bottom to Floor / Flooring	Typical; all floor covering types	Up to 1/2 inches
	At non-combustible sills	3/8 inches
	Bare floors- No flooring or sills	Up to 3/4 inches

B. Hardware Preparation:

1. Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to Door Hardware Schedule and templates furnished as specified in Section 08 71 00.
2. Locate hardware indicated, or if not indicated, according to ANSI/SDI A250.8.
3. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
4. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
5. Coordinate locations of conduit and wiring boxes for electrical connections.
6. Remove mill scale and foreign materials, touch up damaged galvanized or galvannealed surfaces.

C. Hollow Metal Doors:

1. Exterior:
   a. Provide weep openings in bottom of exterior doors.
   b. Seal joints in top edges of doors against water penetration.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine structure, substrates, and conditions under which work is to be installed for conditions detrimental to correct and timely completion.

B. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION

A. Frames:

1. Place frames before construction of adjacent walls.
    a. Where adjacent walls are cast in place concrete, set frames after wall is constructed.
2. Adjust hollow metal door frames for square, alignment, twist, and plumb to following tolerances:
    a. Plumb: Plus or minus 1/16 inches 1.5 mm, measured at jambs at floor.
    b. Level: Plus or minus 1/16 inches 1.5 mm per leaf, measured across width of header.
    c. Square: Plus or minus 1/16 inches 1.5 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    d. Alignment: Plus or minus 1/16 inches 1.5 mm, measured at jambs on horizontal line parallel to plane of wall.
    e. Twist: Plus or minus 1/16 inches 1.5 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
3. Do not remove spreaders until surrounding wall construction is complete.
4. After surrounding walls have been constructed, verify frames remain in alignment.
    a. Re-check for level, plumb, square, twist and issues that will prevent proper fitting of doors.
    b. Correct deficiencies before allowing surrounding construction to proceed.
    c. Coordinate with other trades to correct alignment problems.
5. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
6. Verify frame alignment, and correct deficiencies prior to hanging doors.
7. Install frames with removable glazing stops located on secure side of opening.
8. Provide anchor type specified for wall condition.
9. Align anchors at hinge centers on hinge jamb and at corresponding heights on strike jamb.
10. Secure frame to wall per manufacturer’s instructions.

B. Prime Coat Touchup:

1. Immediately after erection, sand smooth rusted or damaged areas of primer coat.
2. Touch up primer coat with compatible air drying primer.
3. Leave surfaces smooth for finish painting.

C. Field Painting of HM Frames and Doors:

1. Painting of Exterior openings: Specified in Section 09 91 13.

D. Install Sealants:

1. Seal frames to walls.
2. Seal frames to floor slabs and hard floor finishes.
3. Hairline gap at intersections of head and jamb frames intersections of rabbets and stops:
    a. Fill exposed seam with painter’s caulk.
4. Sealants:
    a. Exterior: See Section 07 92 13.

E. Install silencers.

3.3 ADJUSTING AND CLEANING

A. Verify frames remain in proper alignment.

B. Correct deficiencies before proceeding with surrounding construction.

C. Remove protective wrappings from doors and frames.

D. Verify fire labels are intact, and readily visible.

END OF SECTION

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SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Door Hardware, as indicated, in accordance with provisions of Contract Documents.

B. Notify Architect of items which will not operate properly, attain the required fire label, or where components are physically or functionally incompatible.

C. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Hardware Supplier Qualifications:

1. Architectural door hardware supplier with warehousing facilities.
2. Operating in the project's vicinity for a period of not less than 2 years.
3. Certified Architectural Hardware Consultant (AHC) available throughout construction.

B. Finish designations and standards: Builders Hardware Manufacturers Association (ANSI/BHMA) Standard 1301.

C. Regulatory Requirements:

1. Barrier free design requirements of the local jurisdiction and Americans with Disabilities Act (ADA).
2. Listing requirements of the local jurisdiction and UL listing where applicable by type.

1.3 SUBMITTALS

A. Product Data:

1. For each type of material and accessory.

B. Shop Drawings:

1. Complete Hardware Schedule by door.
   a. Complete list of products including model numbers and cut sheets.
   b. Use Heading Numbers logically derived from Architect's Hardware Set numbers.
   c. Hardware Sets shall follow the guidelines established in Door and Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule.
   d. Notify Architect of items which will not operate properly, attain the required fire label, and where components are physically or functionally incompatible.

C. Contract Closeout Information:

1. Schedule of components installed as hardware sets for each opening.
2. Operating and maintenance data.
   a. Parts catalog for each product furnished.
   b. Keying records.
3. Owner instruction report.
4. Letter stating extra material has been delivered.

1.4 SPECIAL WARRANTY

A. Written warranty in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within three years from date of Substantial

Completion, or 25 years from date of Substantial Completion in the case of manual surface closers.

1. Failures include, but are not limited to, the following:
    a. Structural failures including excessive deflection, cracking or breakage.
    b. Faulty operation of door hardware.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

1.5 MAINTENANCE

A. Extra Materials:

1. Provide special tools as supplied by hardware manufacturer, for each different or special hardware component.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hinges:

1. Base:
    a. Hager Hinge
2. Optional:
    a. Stanley Hardware
    b. McKinney
    c. Ives

B. Cylinders:

1. Base:
    a. Same manufacturer as listed for Locks, Latches and Deadbolts.

C. Locks, Latches, and Deadbolts:

1. Base:
    a. Schlage Lock
2. Optional:
    a. Substitutions not allowed.

D. Door Closers:

1. Base:
    a. LCN
2. Optional:
    a. Sargent Manufacturing
    b. Stanley

E. Kickplates, Armorplates, and Door Edging:

1. Base:
    a. Trimco
2. Optional:
    a. Hager Hinge
    b. Burns Manufacturing
    c. Ives
    d. Rockwood Manufacturing
    e. ABH Manufacturing

F. Thresholds, Head Drips, Weatherstripping:

1. Base:
   a. Reese Enterprises
2. Optional:
   a. National Guard Products
   b. Pemko Manufacturing
   c. Zero International

G. Other materials:

1. Base: As indicated.

H. Other manufacturers desiring approval comply with Section 01 61 00 and submit samples of both specified item and proposed item for comparison.

2.2 MATERIALS

A. Finishes and Fasteners:

1. Finishes:

Hardware Finishes				
Hardware Component	Satin Chrome Series			
	Base Metal	ANSI / BHMA	Finish Description	US Equiv.
Locksets and Latchsets	Brass/Bronze	626	Satin Chromium plated over nickel	US26D
Door Pulls, Pushbars, and Pushplates	Stainless Steel	630	Satin Stainless Steel	US32D
Kickplates and Armorplates	Stainless Steel	630	Satin Stainless Steel	US32D
Exit Devices	Brass/Bronze	626	Satin Chromium plated over nickel	US26D
Hinges	Stainless Steel	630	Satin Stainless Steel	US32D
	Steel	652	Satin Chromium plated over nickel	US26D
Thresholds, Weatherstripping, Head Drips	Aluminum	719	Mill finish aluminum	US27
Door stops, holders, pivots, door edging and other unlisted items	Brass/Bronze	626	Satin Chromium plated over nickel	US26D
Patient Latches	Stainless Steel	630	Satin Stainless Steel	US32D
Exposed arms and covers of closers:	Any	689	Powder Coated, Aluminum Color	US20A

   a. Tactile Warning:
      1) Etched, milled or knurled surface treatment.
      2) Provide on corridor-side levers of doors to loading platforms, boiler and mechanical rooms, stages, utility stairs, roof access, communications and electrical closets.

2. Fasteners:
   a. Manufacture hardware to conform to templates.
   b. Prepare for Phillips oval head machine screw installation unless directed otherwise.
   c. Exposed screws to match hardware finish or, if exposed in surfaces of other work, to match finish of other work as closely as possible.
   d. Fasteners in mineral core doors:
      1) Attachment of hinges:
         a) Use screws, which are fully threaded (from tip to head).
         b) For mineral core doors, use thru-bolted half surface hinges.
      2) Attachment of Closers:
         a) Use through-bolts at mineral core doors.
         b) Use fully threaded screws at doors with solid wood blocking.

e. Provide concealed fasteners (unless thru bolted).
f. Provide non-corrosive fasteners.

3. Templates:
   a. Provide templates to door and frame suppliers.
   b. List template numbers on Hardware Schedule submittal for use by fabricators.
   c. Provide copies of approved Hardware Schedule to related suppliers, fabricators, and installers.

B. Hinges:

1. Butt Hinges:
   a. Butts and Hinges: ANSI/BHMA A156.1
   b. Template Hinge Dimensions: ANSI/BHMA A156.7
   c. Self-Closing Hinges: ANSI/BHMA A156.17.
   d. Full mortise, unless noted otherwise.
      1) Non-rising, flat button tips.
      2) Hospital tips: Psychiatric patient areas.
      3) Hospital tips: Inmate areas.
      4) Non-removable pins (NRP): Provide at out-swinging exterior doors and where specifically indicated.
   e. Following table refers to manufacturer's numbers that are considered equal:

Definition of Hinge Types

Type	Manufacturer				Description	
	Hager	Stanley	Ives	McKinney	ANSI	Remarks
1	BB1199	FBB199	5BB1HW	T4B3386 or T4A3386	A5111	Stainless Steel, Heavy Weight, 5-knuckle, 4 Ball Bearing, Non-ferrous for wet/exterior usage.
2	BB1168	FBB168	5BB1HW	T4B3786 or T4A3786	A8111	Heavy Weight, 5-knuckle, 4 Ball Bearing, Steel with Steel Pin.
3	BB1279	FBB179	5BB1	TB2714 or TA2714	A8112	Standard Weight, 5-knuckle, 2 Ball Bearing, Steel with Steel Pin
4	BB1263	FBB268/78	5BB1SCHW	T4B3795 or T4A3795	A8121	Swing Clear Hinge, Heavy Weight, 5-knuckle, 4 Ball Bearing, Steel with Steel Pin
5	1250	2060R	3SP1	1552	K81071F	Spring Hinge, (single-acting), Steel, Use two Type 5 (Spring Hinges) in combination with Type 2 (Heavy Weight Ball Bearing) hinges

NOTES:

Use Type where indicated. It is possible that not all Types will be needed on subject project.

On openings with unequally sized pairs: Utilize same hinge model on both leaves; Hinge type listed for the larger/heavier leaf shall govern.

Use the appropriate variations of the above listed Model Numbers for actual door edge style specified (I.e. Bevel or Square Edge Doors).

Where Type 4 (Swing Clear) or Type 5 (Spring) hinges are called for at Exterior or wet areas: Use the Stainless Steel variations of the above listed Model Numbers.

   f. Hinges Types according to door location and width:
      1) Type 1 - Stainless Steel, Heavy Weight, Ball Bearing Hinge:
         a) Exterior out-swinging doors with non-removable pins (NRP) option.
         b) Exterior in-swinging doors.
   g. Hinge quantities per door leaf:
      1) Leaves up to 60 inches: 2 hinges
      2) Leaves between 61 inches and 90 inches: 3 hinges

3) Leaves between 91 inches and 120 inches: 4 hinges
4) Leaves between 121 inches and 150 inches: 5 hinges
5) Leaves taller than 151 inches: add 1 hinge for each 30 inches increase in leaf height thereafter.

h. Hinge sizes:

Guide to Minimum Sizes of Hinges			
Door Thickness	**Door Width**	**Minimum Hinge Height**	**Minimum Hinge Width**
1-3/8 inches	Up to 32 inches	3-1/2 inches	3-1/2 inches
	From 32 inches to 36 inches	4 inches	
	Greater than 37 inches	4-1/2 inches	
1-3/4 inches	Up to 36 inches	4-1/2 inches	4-1/2 inches
	From 37 inches to 48 inches	5 inches	
	Over 48 inches	6 inches	
2 to 2-1/2 inches	Up to 42 inches	5 inches Heavy Weight	5 inches
	Over 43 inches	6 inches Heavy Weight	

NOTES:

1. The above is a guide to minimum sizes. Consider the actual weight of door leaf being supported and its anticipated frequency of use when determining the actual hinge height.
2. Do not exceed parameters recommended by Hinge manufacturer.
3. Unequal Pairs: Utilize same hinge size for both leaves; Hinge height stipulated for the wider leaf shall govern.
4. Increase the hinge width as required to clear door trim where used. Ensure that door, when opened 180 Degrees will not contact the applied trim.

C. Cylinders:

1. ANSI/BHMA A156.5 Grade 1.
2. Material: Brass or bronze, stainless steel, or nickel silver.
3. Finish: Match lock mechanism to which cylinders are installed.
4. Cylinder Type: Interchangeable cores.
5. IC Format: Full-sized Interchangeable Cores (IC).
6. Cylinder Mechanism:
   a. Conventional, 6-pin tumbler.
   b. Top row consisting of 6-pin tumblers plus additional side bitting.
7. Key Control:
   a. Restrictive.
8. Determine key type required to suit locking mechanism. Include appropriate trim rings, cams, tail pieces, and adaptors.
9. Patented cylinders and keys to protect against unauthorized manufacture.
10. Provide cylinders for all locking mechanisms scheduled.
11. Base Product (proprietary to match existing facility):
    a. Schlage; Optional Products will not be permitted.

D. Keys:

1. Material: Nickel silver

2. Stamping: Permanently inscribe each key with a control number and the following: DO NOT DUPLICATE.
3. Quantity: In addition to one extra blank key for each lock, provide the following:
    a. Cylinder Change Keys: 3
    b. Master Keys: 6
    c. Grand Master Keys: 6
    d. Great-Grand Master Keys: 6

E. Cylindrical Locks and Latches:

1. ANSI/BHMA-A156.2, Series 4000, Grade 1.
2. Heavy duty cylindrical with latch bolt throw as follows:
    a. Single doors: 1/2 inches minimum, or as otherwise required by fire label.
    b. Pair doors: 3/4 inches minimum, or as otherwise required by fire label.
    c. Backset: 2-3/4 inches.
3. Base Product: ND Series by Schlage.
4. Optional Products:
    a. No substitutions allowed.
5. Lever Design: Rhodes lever
6. Functions as indicated in Hardware Sets and accordance with ANSI/BHMA-A156.2.

F. Door Closers (surface applied):

1. General:
    a. ANSI/BHMA A156.4, Grade 1.
    b. UL listed for use on fire doors.
    c. Body Material: Cast iron.
    d. Size door closers to comply with manufacturer's recommendations for door sizes, locations, and accessibility requirements for opening force.
    e. Adjust closer to meet accessibility requirements for opening force and closing speed.
    f. Supply arms, brackets, and plates, as required.
    g. Mount closers on room side of corridor doors unless conditions prohibit such mounting.
    h. Integral back checks.
    i. Include limiting cushion stop at exterior, out-swinging doors.
2. Base Products:
    a. Models 4011 and 4111 by LCN.
    b. Models 4041 and 4041XP by LCN.
3. Optional Products:
    a. 281 Series by Sargent Manufacturing.
    b. QDC100 Series by Stanley.
    c. 9500 Series by Norton.

G. Door Trim and Protectives:

1. Kickplates and Armorplates:
    a. ANSI/BHMA A156.6, Type J100.
    b. Material: Stainless Steel; 0.050 inches thick.
    c. Material: Plastic Laminate, 1/8 inches thick, color as selected.
    d. Height:
        1) Kickplates: 8 inches high.
        2) Armorplates: 34 inches high.

e. Width:
1) Single Doors: 2 inches less door width (LDW).
2) Pair Doors: 1 inch less door width (LDW).
f. Bevel edge on top and sides of plates.
g. Coordinate installation of plates with locks and other hardware items
1) Cutouts where required.

2. Door Edging:
a. Material: Stainless Steel.
b. Minimum Thickness: 0.050 inches thick.
c. Provide where indicated in HW sets.
1) Provide 1 at hinge edge and 1 at latch edge of door.
2) Exception: Omit from hinge edge where continuous geared hinges are scheduled.
d. Height: 34 inches
e. Provide cut-outs for hinges and similar items.
f. Install with supplied screws.
g. Base Product: KE31-1 by Trimco.

H. Perimeter Seals:

1. Where door or frame is extruded aluminum, refer to Aluminum Door/Frame specifications for Perimeter Gasket products.
2. Thresholds:
a. ANSI/BHMA A156.6.
b. Material: Aluminum.
c. UL and ADA compliant.
d. Size for frame depth.
e. Provide required bolt cutouts.
f. Base Products are meant to describe design intent. Contractor to verify that models indicated are appropriate for sill conditions and finishes.
1) Choose from Base Product models wherever possible.
2) Include elevators and other adaptors where required.
g. Base Products:
1) Saddle Thresholds: S404 or S405 by Reese.
2) Saddle Thresholds with Thermal-break: S282, S471or S473 by Reese.
3) Half Saddle Thresholds for offset conditions: S814, S439 or S514 by Reese.
4) Panic Threshold: S248 with pile insert by Reese.
5) Bumper Seal Thresholds with Thermal break: 273x292 FGPK by Pemko.
6) Carpet-to-carpet conditions: S565 by Reese.
3. Weatherstripping:
a. ANSI/BHMA A156.22; air leakage not to exceed 0.50 cubic feet per minute per linear foot of crack when tested to ASTM E 283.
b. Head and Jamb Stops:
1) Surface mounted, adjustable, screwed to frame stops.
2) Base Product: 775 by Reese.
c. Sweeps:
1) Base Product: 810 by Reese.
d. Meeting stiles of door pairs:
1) Base Product: M35 by Reese.

4. Head Drip:
    a. Provide on exterior doors other than main entrance doors.
    b. Bed flange in sealant and screw to head of frame using non-corrosive fasteners.
    c. Base Product: R201 by Reese.

I. Silencers:

1. Silencers are listed in Section 08 11 13 but are required as described in this Article.
2. Provide Silencers at openings except those receiving perimeter gaskets such as weather, fire, fire/smoke, and sound gaskets.
3. Extra Keys:
    a. As specified in Article entitled: Operation – Keying

J. Operation – Keying:

1. Establish keying system with Owner:
2. Provide and set up complete visible card indexed system with key tags and control slips.
3. Tag and identify keys and install in key cabinet.
4. Provide 3 keys for each lock mechanism.
5. Key to existing master key system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Coordinate reinforcement or other preparation of doors and frames.

C. Installation constitutes responsibility for performance.

D. Coordinate installation power supply and communication wiring to electrically operated devices.

3.2 INSTALLATION

A. Install in accordance with manufacturer's installation instructions, supervised or inspected by an AHC.

B. Furnish items of hardware for proper door swing.

C. Permanently install hardware after finishing operations are complete.

D. Protect finishes by temporary coverings as required.

E. Mounting Heights:

Mounting Heights of Hardware	
Item	**Height** [1,2] (to Item Centerline)
Mortise Locksets	40-5/16 inches AFF to Centerline of Strike [3]
Cylindrical Locksets	
Butt Hinges (and Pivots)	Top Hinge: Not more than 11-3/4 inches down from frame
	Bottom Hinge: Not more than 13 inches above floor
	Equally spaced between Top and Bottom Hinges. Refer to Part 2 for quantity required.

Mounting Heights of Hardware	
Item	**Height** [1,2] (to Item Centerline)
Other Items	Comply with SDI and DHI Recommendations

Footnotes/Additional Requirements:

1. Mounting Heights shall also comply with ADA and ICC/ANSI 117.1
2. Mounting Heights shall also comply with Building Code and Fire Codes.
3. Deviation from listed height will be allowed up to + 1-1/2 inches provided this does not cause a conflict between the lock and lite cutouts.

F. Install hardware with fasteners concealed where not required by code to be exposed.

G. Coordinate installation of electric access control hardware.

1. Hardware installer to be responsible for coordination with electrical installer for low voltage installations.

3.3 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware to ensure proper operation or function.

1. Lubricate moving parts with lubricant recommended by manufacturer.
2. Replace units which cannot be adjusted and lubricated to operate smoothly.

B. Approximately six months after substantial completion, check and readjust to assure proper function of doors and hardware.

1. Clean and lubricate operational items.
2. Replace items which have deteriorated or failed.
3. Prepare a written report of current and predictable problems in operation of hardware.
4. Report visit and furnish copy of report to Owner with copy to Architect.

C. When hardware is installed more than one month prior to final acceptance or occupancy, during week prior to acceptance or occupancy, make a final check and adjustment of hardware items.

1. Remove temporary coverings.
2. Clean and lubricate for proper function and finish.
3. Adjust door control devices to compensate for operation of heating and ventilating equipment.

D. Instruct Owner's personnel:

1. Operating and maintenance procedures.
2. Key control system.
3. Converting cylinders from Construction to Permanent key configuration.

3.4 HARDWARE SETS – EXTERIOR

A. HW-120:

1. Hinges
2. Cylindrical Lockset, passage function
3. Closer
4. 2 Kickplates (both sides)
5. Threshold
6. Weatherstripping
7. Head Drip

END OF SECTION

DIVISION 09

FINISHES

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SECTION 09 91 13
EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Exterior Painting, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Definitions:

1. "Paint" and "painting" refer to applied coatings.

B. Work Included:

1. Exterior surfaces scheduled to be painted, unless indicated to be painted under other sections.

C. Surfaces not to be painted:

1. Colored, split-face, patterned, ground-face, glazed, and other concrete masonry units with integral architectural finish.
2. Anodized aluminum, stainless steel, chromium plate, glass, copper, bronze or similar materials.
3. Moving parts of valves, operating units, mechanical and electrical parts, such as valve and damper operators, sending devices, motor and fan shafts.
4. Code labels, such as UL, FM that are Mylar or flat, non-embossed, plates.
    a. Embossed plates and labels stamped into frames will be painted, label and information on label to be readily visible and convenient for identification by authority having jurisdiction.
5. Equipment identification or rating plates.
6. Items having complete factory finish with exception of:
    a. Exterior mechanical equipment.
    b. Exterior electrical equipment.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer's data for each paint type to be applied indicating conformance to specifications.

B. Samples:

1. Manufacturer’s full palette of colors for selection by Architect.
2. Provide three 8-1/2 inches x 11 inches samples of each color and finish selected.
3. MPI Gloss samples.

C. Contract Closeout Information:

1. Maintenance data:
    a. See Section 01 78 23.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide paint as product of one manufacturer as far as possible.

B. Paint, stain, and coating systems listed are Sherwin Williams unless noted otherwise.

1. Use comparable performance and aesthetic requirements for Paints by Optional manufacturers.

C. Paints:

1. Base:
   a. Sherwin-Williams.
2. Optional:
   a. Benjamin Moore.
   b. PPG Paints.

D. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Paints and Stain Systems:

1. Paint, stain, and coating systems listed are Sherwin-Williams unless noted otherwise.
2. Colors:
   a. As selected by Architect from manufacturer’s full palette and as indicated in Section 23 05 53.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces for defects and correct to prevent unsatisfactory results.

B. Verify compatibility of intermediate and topcoat finishes applied over surfaces primed by others.

C. Commencement of work constitutes acceptance of surfaces and responsibility for performance.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could affect appearance or impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
2. Remove mildew and neutralize surface.

C. Prior to painting, test surfaces with moisture meter.

1. Paint when moisture is within paint manufacturer's acceptable limits.

D. Ferrous Metal and Hollow Metal:

1. Follow requirements of SSPC SP1 and SP3.
   a. Except where higher prep levels are indicated.
2. Wire brush or grind as necessary to remove shoulders at edge of sound paint to prevent telegraphing.
3. Touch up damaged shop coats.
4. For surfaces with touched up shop coat, omit first coat.
5. Hollow metal frame joints at intersections of Rabbets, Stops, and Soffit Joints:

a. Neatly fill corner seam with painter's caulk (in field) prior to painting.

E. Galvanized Metal and Non-anodized Aluminum:

1. Follow requirements of SSPC SP1.
2. Treat surfaces with galvanized surface cleaner as recommended by primer and topcoat manufacturer.

3.3 APPLICATION

A. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar items, or provide ample in place protection.

B. Touch up abraded areas of shop prime coats, suction or hot spots in plaster, gypsum wallboard, concrete block, and concrete before painting.

C. Provide coverage to hide.

1. Evenly spread and smoothly flow on for full, smooth cover.
2. Apply additional coats where undercoats show until paint film is of uniform finish and color.

D. Back prime wood trim with penetrating sealer.

E. Apply additional coats in accordance with manufacturer’s instructions.

F. Finish closets and semi-exposed surfaces to match nearest adjoining surfaces.

1. Include surfaces behind grills.

G. Upon completion of painting, replace removed items and remove protection.

H. Finish colors not indicated shall be selected by Architect from paint manufacturer’s standard colors.

3.4 PROTECTION AND CLEANUP

A. Provide WET PAINT signs.

B. Protect adjacent work from damage by painting and finishing work.

C. Remove temporary protective wrappings, after completion of operations.

D. Clean, repair or replace, and repaint damaged work.

3.5 EXTERIOR PAINT SYSTEMS

A. Metal Doors, Frames and Miscellaneous Metals - Ferrous, Primed, Zinc-coated, and Aluminum:

1. Water based urethane, Gloss Level 4, Satin:
   a. Sherwin-Williams:
      1) Prime coat: Pro Industrial Pro-Cryl Universal Acrylic Primer.
      2) Intermediate coat: Water based Acrolon 100 Urethane, Satin.
      3) Topcoat: Acrolon 100 Urethane, Satin.

END OF SECTION

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DIVISION 13

SPECIAL CONSTRUCTION

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SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Complete metal building systems, including, but not limited to:
   a. Requirements for delegated design.
   b. Materials.
   c. Fabrication.
   d. Shipment.
   e. Erection at the Site.
   f. Components as specified.

B. Related Requirements: Include, but are not necessarily limited to:

1. Section 01 35 73 - Delegated Design Procedures.
2. Section 07 92 13 – Exterior Joint Sealants.
3. Section 08 11 13 - HM Doors and Frames.
4. Section 08 71 00 - Door Hardware.
5. Section 09 91 13 – Exterior Painting.

1.2 REFERENCES

A. Referenced Standards: Include, but are not necessarily limited to, the following:

1. American Architectural Manufacturers Association (AAMA):
   a. 621, Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
2. ASTM International (ASTM):
   a. A36/A36M, Standard Specification for Carbon Structural Steel.
   b. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   c. A563, Standard Specification for Carbon and Alloy Steel Nuts.
   d. A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
   e. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   f. D2244, Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
   g. D4214, Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
   h. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
   i. E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.
   j. E1592, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
   k. F436, Standard Specification for Hardened Steel Washers.
   l. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   m. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

n. F3125, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

3. American Welding Society (AWS):
   a. D1.1/D1.1M, Structural Welding Code - Steel.
   b. D1.3/D1.3M, Structural Welding Code - Sheet Steel.
4. FM Global (FM):
   a. FMRC Standard 4471, Approval Standard for Class 1 Roofs for Hail Damage Resistance, Combustibility, and Wind Uplift Resistance.
5. International Accreditation Service (IAS):
   a. AC472, Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems.
6. Metal Building Manufacturer's Association (MBMA):
   a. Low Rise Building Systems Manual.
7. Research Council on Structural Connections (RCSC):
   a. Specification for Structural Joints Using High-Strength Bolts.
8. Steel Door Institute (SDI):
   a. 112, Zinc-Coated (Galvanized/Galvannealed) Steel Doors and Frames.
9. Steel Door Institute/American National Standards Institute (SDI/ANSI):
   a. A250.6, Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   b. A250.8, Recommended Specifications for Standard Steel Doors and Frames.
10. Society for Protective Coatings/NACE International (SSPC/NACE).
    a. SP 6/NACE No. 3, Commercial Blast Cleaning.
11. Underwriters Laboratories, Inc. (UL):
    a. Building Materials Directory.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Comply with coordination requirements in Section 01 35 73 - Delegated Design Procedures.

B. Pre-Design Conference:

1. Pre-design conference is not required for metal building systems for this Project.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Delegated Design Professional:
   a. Unless modified or augmented in this Section or elsewhere in the Contract Documents applicable to metal building systems, delegated design professional’s qualifications and responsibilities shall be in accordance with Section 01 35 73 - Delegated Design Procedures.
2. Manufacturer of Metal Building Systems:
   a. Manufacturer must be member in good standing of the MBMA or Manufacturer must be currently approved by IAS Accreditation Committee under the Inspection Programs for Manufacturers of Metal Buildings Systems IAS AC472 to assure compliance with fabrication Special Inspections as required by the building code.
3. Erector of Metal Building Systems:
   a. Erector (installer) shall be approved in writing by metal building manufacturer.

b. Erector shall possess not less than 10 years current experience in erection of similar structures. Upon Engineer's request, submit documentation of such experience, including name of project, location, project owner, size of metal building erected, and other information required by Engineer.

4. Installer, erector and applicator are synonymous.
5. Nomenclature as listed in Bibliography of the MBMA Low Rise Building Systems Manual.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Delegated Design Professional's Instruments of Service Submittals: Submit in accordance with this Section and Section 01 35 73 – Delegated Design Procedures:
   a. Certificate of compliance, including indication of all performance and design criteria values used for performance and design criteria indicated in the Contract Documents.
   b. Design Drawings:
      1) Show and indicate layout of buildings, including dimensions, sizes and types of ingress and egress from buildings and rooms, location and sizes of windows and other openings in walls, floors, and roofs, elevations (using Project datum) of building elements, and other information necessary and required to demonstrate to Engineer compliance with performance and design criteria shown and indicated in the Contract Documents.
      2) Plans and elevation drawings minimum scale: 1/8-inch = 1 foot.
      3) Details, and sections minimum scale: 1.5 inches = 1 foot.
   c. Design specifications.
2. Samples:
   a. Metal color and finish Samples of roof and wall panels, roof trim, wall trim, and interior liner panel colors for Engineer's selection and approval.
   b. Color chart is unacceptable for Samples required under this Section.

B. Informational Submittals: Submit the following:

1. Shop Drawings Approved by Delegated Design Professional:
   a. Plans and elevation drawings minimum scale: 1/8-inch = 1 foot.
   b. Details, and sections minimum scale: 1.5 inches = 1 foot.
   c. List of all design loads and combination of loads.
   d. Size and location of each component of building.
      1) Show and indicate clearance under structural framing members, both horizontal and vertical.
      2) Show cross-section of components.
   e. Fasteners and details of fasteners connecting each component of building.
   f. Size, location, and details of anchor bolts, base plates, and other components fastened to building's foundation and other Work fully designed by Engineer.
      1) Size anchor bolts and base plates assuming 3000 psi concrete.
   g. Details of wall panels, roof panels, finishes, flashings, closures, closure strips, trim, gutters, downspouts, sealant, and all other miscellaneous components.
2. Product Data Approved by Delegated Design Professional:
   a. Acknowledgement that items submitted comply with requirements of standards referenced in this Section.
   b. Manufacturer's technical reference manual containing all of manufacturer's standard construction details and specifications.
      1) Manufacturer's erection manual containing all details and methods for installation of building frame, roof systems, wall systems, and accessories.
      2) Edit to clearly indicate items not used for the Project.

3. Calculations Sealed and Signed by Delegated Design Professional:
    a. Submit, for purposes indicated in Section 01 35 73 – Delegated Design Procedures, complete structural engineering calculations for each metal building system, sealed and signed by delegated design professional.
    b. Include in calculations list of design loads and loads transmitted to foundation (and other Work fully designed by Engineer) through columns or walls and location where loads occur.
4. Certifications:
    a. Submit manufacturer's certification of compliance that steel was fabricated in accordance with Contract Documents and delegated design professional's requirements.
5. Supplier's Instructions:
    a. Supplier's written instructions for handling, storing, and installing metal building systems and related components at the Site.
6. Source Quality Control Submittals:
    a. Submit required source quality control Submittals when requested by Engineer.
7. Field Quality Control Submittals:
    a. Submit written results of field quality control activities required by this Section and elsewhere in the Contract Documents.
8. Reports of Supplier's Visits to the Site:
    a. Submit written report of each visit to the Site of Supplier's field representative, indicating date and time of visit, purpose of visit, conditions encountered or observed, activities performed, problems resolved, and other pertinent matters.
9. Qualifications Statements:
    a. Building manufacturer, when requested by Engineer.
    b. Delegated design professional.
    c. Building installer/erector, including copy of building manufacturer's approval of erector/installer.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data:
    a. Submit in accordance with Section 01 78 23 – Operation and Maintenance Data.
2. Warranty Documentation:
    a. Manufacturer's standard warranty, unless fully superseded by required special or extended warranties.
    b. Manufacturer's special or extended warranties, if any, required by this Section.
3. Record Documents:
    a. Submit complete record drawings and record specifications for metal building systems, showing and indicating as-constructed conditions.
        1) Total weight of products provided.

D. Maintenance Material Submittals:

1. Furnish the following items and submit documentation of delivery to and acceptance of such items by Owner:
    a. Extra Materials:
        1) One quart of paint for each type of paint and color, for Owner's (or facility manager's) use for touch-up after final payment to Contractor.

1.6 EXTRA WARRANTY

A. General:

1. Comply with Section 01 78 36 - Warranties.

B. Proposed exceptions to Warranty Requirements:

1. Prior to or with initial Action Submittals required by this Section, provide to Engineer written notice, delivered in accordance with the Contract's requirements for giving notices, clearly and expressly indicating, in detail, proposed exceptions to warranty requirements of the Contract Documents.
2. Failure to properly deliver such notice within the indicated time shall constitute Contractor's and manufacturer's irrevocable commitment to fully comply with the Contract's warranty requirements for metal building systems.
3. Proposed exceptions may be grounds for disqualifying the associated manufacturer, at Engineer's or Owner's sole discretion.
4. In event manufacturer is disqualified for this reason, Contractor shall provide another acceptable manufacturer's metal building systems for no change in Contract Price or Contract Times.

C. Manufacturer's Standard Warranty:

1. Submit metal building system manufacturer's standard warranty for those metal building system elements not otherwise covered by required special or extended warranty.

D. Manufacturer's Special or Extended Warranty:

1. In addition to manufacturer's general, standard printed warranty, furnish manufacturer's special or extended (as applicable) warranty providing Owner with the benefits indicated below, for the durations indicated below.
    a. Furnish manufacturer's 20 year special warranty (warranty period commencing upon Substantial Completion) for factory-applied PVDF coating system against blistering, chipping, cracking, peeling, and color fading of wall and roof panels.
2. Weathertightness Warranty for Roof:
    a. Metal building system manufacturer shall warrant weathertightness for a period of 10 years (starting upon Substantial Completion) against leaks in roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
    b. Warranty shall be signed by both metal roof system manufacturer and metal roof system installer.
    c. Manufacturer's liability for weathertightness warranty for roof is capped at $0.50 per square foot of roof area.
3. Warranty Against Corrosion-Related Perforation of Roofs and Walls:
    a. Metal building system manufacturer shall warrant metal building systems for 20 years (commencing upon Substantial Completion) against perforation of metal roof and wall panels due to corrosion under normal weather and atmospheric conditions.
    b. Warranty shall be signed by metal roof system manufacturer.
    c. Acrylic Coated Galvalume: Materials shall not rupture, fail structurally, or perforate for 20 years (commencing upon Substantial Completion) when subjected to normal atmospheric conditions prevailing at the Site, including corrosive substances in the atmosphere and precipitation.
4. Paint Film Warranty:
    a. Metal building system manufacturer shall warrant paint film for 25 years against cracking, peeling, chalking, and fading of exterior coating on painted roof and wall panels.
    b. Warranty shall be signed by either metal building systems manufacturer or roof system manufacturer.
    c. Warranty shall indicate that coating contains 70 percent Kynar 500 or Hylar 5000 resin.
    d. Failure of adhesion, peeling, chalking, or cracking for 25 years (commencing upon Substantial Completion).
    e. Color fading in excess of five Hunter units in accordance with ASTM D2244 for 25 years (commencing upon Substantial Completion).

5. Chalking in excess of No. 8 rating in accordance with ASTM D4214 for 25 years (commencing upon Substantial Completion).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, provide the required quantity of metal building systems Work by one of the following for each type of system or material indicated:

1. Metal building systems:
    a. Behlen Manufacturing Co.
        1) No substitutions permitted.
2. Contact information:
    a. Midwest Erectors and Construction LLC
    Brent Burt
    13632 S. 220th Street, Ste 1
    Gretna, Nebraska 68028
    Ofc: 402-991-9612
    Fax: 402-991-9613
    Cell: 402-601-3568
    brent@midwesterectors.com

2.2 DESCRIPTION

A. Description of Metal Building Systems – General:

1. Provide metal building systems that are non-insulated, single slope type with vertical walls and single slope type roof.
2. Provide cross bracing in the side walls perpendicular to the rigid frame.
3. Metal building systems with flush girts shall be provided with cast-in-place anchor bolts, due to minimum edge distance requirements for alternate anchor types.

B. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of load-bearing end-wall and corner columns and rafters.

2.3 PERFORMANCE AND DESIGN CRITERIA

A. Critical Dimensions:

1. Building Size:
    a. As indicated on the Drawings.
2. Roof slope:
    a. As indicated on the Drawings.
3. Provide minimum clear height of 27’ – 1” feet at lowest interior structure line.
4. Horizontal Plan Dimensions:
    a. Measure to interior face of girts / outside face of rigid frame.
5. Eave Height:
    a. Measure from top of finished floor to intersection of insides of roof and sidewall sheets.
6. Clear height between finished floor and bottom of roof steel: Indicated on the drawings.

B. Building Foundation:

1. Footings, foundations, anchorages, and piers have been designed by Engineer based on assumed loadings and reactions. Comply with “Coordination” requirements in Section 01 35 73 - Delegated Design Procedures, and elsewhere in the Contract Documents.
    a. Member sizes and geometry may vary depending on metal building provided.

b. Do not fabricate or provide such members until Engineer has verified compliance with the Engineer-designed foundation with approved Submittals required for metal building systems to be provided.

c. Design and provide column base plates as pinned connections. Fixed base plates are unacceptable.

C. Modifications:

1. Metal building systems with dimensional variations from those in the Contract Documents may be proposed during construction (comply with the Project's Instructions to Bidders and Bid Form relative to basing the Bid on providing metal building systems that are non-compliant with the proposed Contract Documents) provided that the metal building systems:
   a. Comply with all required interior, horizontal dimensions and clear heights shown or indicated in the Contract Documents.
   b. Comply with locations and sizes of doors, windows, and other openings and penetrations in metal building systems, including those for HVAC systems.
   c. The Contract Price includes costs for: (1) compensating Owner for cost of engineering services for modifications to design of foundations or other Work or construction, and (2) construction costs, including cost of all Work needed to accommodate such modified design, including metal building systems, other Work designed by Engineer, and existing, adjacent construction.
   d. Contractor is not entitled to any change in Contract Times for such modified designs.
   e. Bidder and Contractor understand and accept that Engineer has sole authority to approve "or-equals" and substitutes proposed.
2. Metal building system dimensional changes (horizontal, vertical, or both) resulting in either 5 percent change of enclosed building volume or lighting height or spacing, shall be addressed by incorporating necessary changes to mechanical or electrical systems or other system or component impacted, at no cost to Owner. Where metal building approved by Engineer necessitates revisions to design of systems designed by Engineer, Contractor shall (1) compensate Owner for Owner's cost for Engineer's revisions to the design; (2) compensate Owner for additional costs incurred under other prime construction contracts, if any, arising from such change in metal building systems; and (3) be entitled to no change in Contract Price or Contract Times for modifications to other Work under the Contract resulting from such modifications to metal building systems.
   a. Engineer's approval of such changes is required prior to Supplier's fabrication and furnishing changed item or systems.
   b. Does not apply to structural member sizes.
3. Completed metal building shall be free of excessive noise from wind-induced vibrations under wind loading required by Laws and Regulations, or as indicated in the Contract Documents, whichever is greater to be encountered at the Site and shall comply with the design criteria indicated below.

D. Roof Live Loads:

1. Roof panels:
   a. In accordance with applicable building code.
   b. 25 pounds per square foot uniformly distributed live load.
   c. 200-pound concentrated (point) live load (over 1-foot by 1-foot area) located at center of maximum roofing (panel) span.
   d. The most severe condition shall govern.
2. Roof framing members:
   a. In accordance with applicable building code.
   b. 25 pounds per square foot uniformly distributed live load.
3. The above loads are in addition to other applicable equipment loads and shall be applied to horizontal projection of roof.

E. Snow Loads:

1. Design structure for snow loading in accordance with applicable building code.
    a. Project Site conditions are as follows:
        1) Basic ground snow: 25 pounds per square foot.
        2) Uniform Roof Snow: 21 pounds per square foot.
        3) Importance factor: 1.
        4) Snow exposure coefficient: 0.9.
2. Design roof panels, secondary support members and primary framing where appropriate for snow load drifting accumulation in accordance with applicable building code.

F. Wind Loads:

1. Design and provide metal building systems for wind loading in accordance with applicable building code.
    a. Project Site conditions are as follows:
        1) Basic wind speed: 115 miles per hour.
        2) Site exposure: Class C.
        3) Importance factor: 1.
        4) Enclosure type: Partially enclosed.

G. Seismic (Earthquake) Loads:

1. Design and provide metal building systems for seismic forces in accordance with applicable building code.
    a. Site conditions are as follows:
        1) Importance factor: 1.
        2) Seismic design category: B.

H. Auxiliary Loads:

1. Incorporate into design loading other superimposed loads as part of design, fabrication, and erection requirements and combine with normal design (dead, live, seismic and wind) loads as indicated below.
    a. Static Loads:
        1) 3 pounds per square foot.
2. Coordinate and verify loading and location of auxiliary loads before designing and fabricating related metal building systems.

I. Combination of Loads:

1. Combining of dead, live, wind, seismic and auxiliary loads for design and fabrication of metal building systems as required by applicable building code, unless required otherwise in the Contract Documents.
2. Horizontal sway deflection of building due to combination of required design loads:
    a. H/60.
3. Deflection of purlins and secondary members shall not exceed L/180 of subject member's span when supporting applicable vertical live, dead, and auxiliary loads.
4. Wind beams supporting masonry walls: Maximum allowable deflection L/240 of subject member's span when resisting applicable loads.
5. Lintel beams supporting brick or masonry: Maximum allowable deflection of lesser of L/600 of span or 0.3 inch.

2.4 MATERIALS

A. Steel:

1. Structural Shapes and Plate:

a. W-shapes and WT-shapes: ASTM A992/A992M.
b. All other plates, bars and rolled shapes: ASTM A36/A36M.
c. Unless otherwise shown or indicated on the Drawings.

B. Bolts, Nuts and Washers, High Strength:
1. Bolts: ASTM F3125, Grade A325.
2. Nuts: ASTM A563.
3. Washers (hardened): ASTM F436.
4. Galvanized, ASTM A153/A153M.
5. Provide two washers for each bolt.

C. Bolts and Nuts:
1. ASTM A307, Grade A.
2. Galvanized, ASTM A153/A153M.

D. Anchor Bolts:
1. ASTM A307, ASTM A36/A36M, galvanized steel.
2. Embedment details will be prepared by Engineer upon Engineer's approval of anchor bolt and loading information in required Submittals. Comply with such embedment details by Engineer without change in the Contract Price or Contract Times.

E. Fasteners:
1. Roof and wall panels: 300 series stainless steel, ASTM F593.
2. Miscellaneous fasteners: Corrosion resistant.

F. Structural members required to be hot-dipped galvanized shall be not less than 12 gage thickness.

G. Roof and Fascia Panels:
1. Roof and Facia Panels - General:
a. Galvalume in accordance with ASTM A792/A792M.
1) Painted surfaces: AZ50.
2) Unpainted surfaces: AZ55.
b. Provide clear acrylic film for additional protection.
1) Provide for each side of each panel.
2. Wall Panels:
a. Galvalume in accordance with ASTM A792/A792M.
1) Painted surfaces: AZ50.
2) Unpainted surfaces: AZ55.
b. Provide clear acrylic film for additional protection.
1) Provide for each side of each panel.

H. Perimeter Trim, Panel Closures, Flashing and Counterflashing:
1. Same material and factory applied finish to match roof and wall panels.

I. Translucent Panels: ASTM D3841, Grade 1 (weather resistant).

J. Gutters and Downspouts:
1. Same material and factory applied finish to match roof panels.

K. Grout: See Division 03.

L. Closures: Neoprene.

M. Calking and Sealants:

1. Comply with Section 07 92 13 – Exterior Joint Sealants.

2.5 FABRICATION

A. Fabrication - General:

1. Fabricate metal building systems' structures, roof panels, wall panels, accessories and trim in accordance with requirements of AISC and MBMA.
2. Provide necessary and required clips, flashing angles, caps, channels, closures, bases and other miscellaneous trim necessary or required for complete water and airtight installation.
    a. Provide inside closure at base of corrugated panels and outside closure at top of corrugated panels in addition to other closure strips necessary or required.
        1) Form closure strips to fit corrugation of metal panels and securely support in place.
        2) Closure strips shall fit between corrugated panels and trim or flashing as necessary or required to completely separate interior of metal building system from building's exterior.
    b. Provide flashing at intersections of wall panels and roof panels, and above openings in wall and roof panels, in addition to other flashing necessary or required.
        1) Provide form flashing to provide the following:
            a) Completely limit precipitation and other exterior moisture to building's exterior.
            b) Provide watertight seal and be securely fastened in place.
    c. Provide sealant at edges where metal panel trim or flashing is adjacent to metal building system's foundation, in addition to other sealants necessary or required.
3. At openings, such as for doors, and others (if any), provide additional framing and fasteners as necessary and required to structurally replace wall panel, framing, or both (as applicable for the opening) displaced.
4. Fabricate and prepare material for shipment and assembly at the Site.
5. Factory-punch framing to receive fasteners.

B. Structural Steel:

1. Structural Mill Sections or Welded-up Plate Sections: Design in accordance with AISC Specification for Structural Steel Buildings.
2. Cold-Formed Steel Structural Members: Design and provide in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
3. Structural System: Design and provide in accordance with applicable building code and requirements of this Section and other relevant requirements of the Contract Documents.

C. Primary Framing:

1. Painted Steel.
    a. Provide structural components with primer paint coats.
        1) Shop paint, prime and finish coats, all surfaces that will be inaccessible after erection.
2. Galvanized Steel, where noted.
3. Rigid Frames:
    a. Frames: Welded-up plate section columns and roof beams, complete with necessary splice plates for bolted field assembly.
    b. Base Plates, Cap Plates, Compression Splice Plates, and Stiffener Plates: Factory welded into place and connection holes factory fabricated.
    c. Columns and Roof Beams: Fabricated complete with holes in webs and flanges for attachment of secondary structural members and bracing.
    d. Bolts for Field Assembly of Frame Members: High-strength bolts.
4. Endwall Structural Members:

a. Cold-formed channel members designed and provided in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members or welded-up plate sections designed and provided in accordance with AISC Specification for Structural Steel Buildings.
b. Endwall corner posts, endwall roof beams, and endwall posts as required by design criteria.
c. Splice Plates and Base Clips: Shop fabricated complete with bolt connection holes.
d. Base Plates, Cap Plates, Compression Splice Plates, and Stiffener Plates: Factory welded into place and connection holes shop fabricated.
e. Beams and Posts: Factory fabricated complete with holes for attachment of secondary structural members.

5. Intermediate Frames:
a. Substituted for end-wall roof beams, when specified.
b. Factory fabricate necessary endwall posts and holes for connection to intermediate frame used in endwall.

D. Secondary Structural Members:

1. General:
a. Acrylic-coated G30 galvanized steel.
b. Meet or exceed performance requirements of SSPC Paint-15
2. Girts:
a. Provide bypass girt system.
3. Purlins:
a. Purlins:
1) “Z” or “C” shaped, precision-roll-formed, in different gauges to comply with specified loading conditions.
2) “Z” and “C” sections shall be designed and provided by metal building systems Supplier.
b. Eave Members:
1) Eave Struts:
a) “C”-shaped precision-roll-formed, in different gauges shall meet specified loading conditions.
b) Factory punched “C” sections to be design by manufacturer.
2) Girts:
a) “Z” or “C" shaped, precision-roll-formed, in different gauges to comply with specified loading conditions.
b) “Z” or “C” sections shall be designed and provided by metal building systems Supplier.
3) Outer Flange of Girts: Factory-punched holes for panel connections.
c. Bracing:
1) Locate bracing as indicated on the Drawings.
2) Diagonal Bracing:
a) Hot-rolled rods of sizes and sections shall be designed and provided by metal building system Supplier.
b) Attach to columns and roof beams.
c) Optional fixed-base wind posts or pinned-base portal frames may be provided in lieu of wall rod bracing on buildings as required.
3) Flange Braces and Purlin Braces: Cold formed and provided as shown and indicated on the Drawings.

E. Welding:

1. Welding Procedures, Operator Qualifications, and Welding Quality Standards:
    a. AWS D1.1.
    b. AWS D1.3.
2. Welding inspection, other than visual inspection as defined by AWS D1.1, paragraph 6.9, shall be identified and negotiated before bidding.
3. Certification of Welder Qualification: Submit when requested by Engineer.

F. Framed Openings:

1. Walls:
    a. Provide necessary and required subframing, including connections, to support wall openings, including doors, and penetrations for piping, penetrations for ductwork, and others.
        1) Material gage shall be determined by metal building system Supplier and shall be appropriate for opening size and geometry.
    b. Size and location of openings shall be as shown or indicated on the Drawings.
    c. Jamb, lintel and girts:
        1) Steel:
            a) Factory-applied primer coat.
        2) Metal building system Supplier shall provide correct size opening for penetration scheduled, shown or indicated.
    d. Provide trim to cover exposed areas of opening frames. Trim color shall match color of wall panels.
2. Roofs:
    a. Provide necessary roof subframing to support roof mounted equipment and to frame roof penetrations.
        1) Material gage shall be determined by metal building system Supplier, appropriate for size of equipment or opening.
    b. Location of roof-mounted equipment and roof or wall openings shall be as shown or indicated on the Drawings.
    c. Purlins, angles, clips:
        1) Steel:
            a) Factory-applied primer coat.
        2) Metal building system Supplier shall provide correct size of opening for penetration scheduled, shown or specified.

2.6 ROOF PANEL SYSTEM

A. Metal Roof Panel System 3: (ADP-1):

1. Performance:
    a. Design and provide roof panels to support a 200-pound load distributed evenly over 2 square feet, centered between purlins, without exceeding a panel deflection-to-span ratio of 1/180 inch a 2-span condition.
    b. Comply with “Roof System Performance Requirements” provision, below, in this Section, which indicates additional requirements.
2. Materials:
    a. Steel.
    b. Thickness: 26 gauge.
    c. Finish: Factory-applied color coating.
        1) PVDF Coating.
3. Factory roll-formed panel.
4. Standing seam interlocking rib configuration.

5. Machined seaming.
6. Provide panels of maximum possible lengths to minimize end laps.
7. Extend eave panels beyond structural line of sidewalls.
8. Factory-punch panels at panel ends to match factory-punched holes in eave structural member.
9. Panel End Splices: Factory-punched and factory-notched.
10. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid four-panel lap-splice condition.
11. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
12. Self-Drilling Fasteners: Unacceptable.
13. Fasteners in accordance with manufacturer's standard recommendations.
14. Provision for Expansion and Contraction:
    a. Provision for Thermal Expansion Movement of Roof Panels:
        1) Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100 degrees F temperature difference between interior structural framework of building and of roof panels.
        2) Slotted Holes: Allow thermal movement of panels without detrimental effect on roof panels.
15. Roof panels based on: Behlen Mfg.
    a. Profile: ADP-1.
    b. Panel width: Not less than 3 feet.
    c. Panel depth: Not less than 2 inches.
    d. Panel corrugations:
        1) Majors: Four per panel at 12 inches on centers, 1.5 inches high by 2-7/8 inches wide tapering, nominal.
        2) Minors (in flat portion): Two per panel flat zone, 1 inch wide, 1/8-inch high, spaced at 4 inches on centers, between major corrugations.
    e. Panel Length:
        1) Sufficient to cover entire length of unbroken roof slope up to 40 feet.
        2) When cut panels are required, provide a 20-foot minimum panel length.
        3) Provide 6-inch end laps at each panel.
    f. Panel Side Laps:
        1) Overlap one major corrugation.
        2) One of the Outboard Corrugations: Formed as overlapping corrugation.
        3) Other Outboard Corrugation:
            a) Formed as underneath corrugation.
            b) Full corrugation shall provide bearing support to side lap.
            c) Formed with continuous-length sealant groove.
16. Color:
    a. Will be selected by Owner from manufacturer's full range of primary and secondary colors.
17. Accessories:
    a. Provide necessary trim accessories to provide a weathertight building.

B. Roof System Performance Requirements:
1. Design and provide roof paneling system for slope of not less than 0.5-inch rise over 1-foot run.
    a. Roof slope is shown or indicated on the Drawings.

2. Design and provide roof paneling system to support design live, snow, and wind loads.
3. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and parapets as roof expands and contracts with temperature changes.
4. UL Wind Uplift Classification Rating, UL 580: Class 90.
5. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E1592.

C. Provision for Expansion and Contraction:

1. Clips with movable tab.
2. Stainless Steel Tabs: Provide factory centered on roof clip when installed to allow full movement in either direction.
3. Maximum Force of 8 pounds: Required to initiate tab movement.
4. Each clip shall accommodate not less than 1.25 inches movement in either direction.
5. Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100 degrees F temperature difference between interior structural framework of building and of roof panels.

D. Translucent Panels (Roofs and Walls):

1. Translucent panels shall be compatible with adjacent panels and profile.
2. Provide nominal weight panel of not less than eight ounces per square foot.
3. Roof panels shall be capable of sustaining a 200-pound concentrated load on a 1-foot square at any or all locations on panel without rupture.
4. Roof panels shall be UL 90 rated.
5. Non-insulated Panel:
    a. Smooth finish on both sides.
6. Insulated Panel:
    a. Fabricate insulating units of two sheets of glass-fiber-reinforced polyester, translucent plastic separated by air space.
    b. Metal edge trim fabricate full length of each side of panel with metal edge for seaming into standing-seam roof panel joint.
7. Material:
    a. Fiberglass.
8. Color:
    a. White.
9. Light transmission: 45 percent or greater, in accordance with ASTM D1494.
10. Mastic for Translucent Panels: Non-staining, saturated vinyl polymer as recommended by translucent panel manufacturer for sealing laps.
11. Profile:
    a. Match wall panel profile.
12. Quantity, Locations, and Orientation: As shown or indicated on the Drawings.
13. Size:
    a. As shown and indicated on the Drawings.

2.7 METAL WALL AND FASCIA PANELS SYSTEM

A. Metal Wall and Fascia Panels:

1. Material:
    a. Steel.
    b. Thickness: 24 gauge.
    c. Finish: Factory applied color coating.

1) PVDF Coating.
2) Smooth finish.

2. Length sufficient to cover entire height of unbroken wall up to 40 feet.
3. Roll-form panels with alternating box corrugations.
4. Interlocking panels.
5. Concealed fasteners.
6. Wall panels based on: Behlen Manufacturing to indicate required standard for materials provided. Similar items from other manufacturers indicated in this Section are acceptable upon Engineer's approval.
7. Profile: ADP-1.
8. Panel width: 36 inches nominal.
9. Color:
   a. To be selected by Engineer (in consultation with Owner) from manufacturers full range of primary and secondary colors.
10. Accessories:
    a. Provide all necessary trim accessories to provide a weathertight building.

B. Insulated Metal Wall and Fascia Panels System:

1. Thickness:
   a. Exterior-Faced Panels: 26 gage.
   b. Interior Face: 26 gage.
2. Core:
   a. Poured-in-place polyurethane foam with not less than 93 percent closed-cell structure.
3. Finish:
   a. Factory-applied color coating.
   b. Smooth finish.
4. Steel-faced, shop-assembled, factory-foamed, insulated panel units.
5. Length sufficient to cover entire height of unbroken wall up to 40 feet.
6. One piece from base to top of wall.
7. Roll-form panels with alternating box corrugations.
8. Interlocking panels, double tongue-and-groove, side-joint design.
9. Exposed fasteners.
10. Wall panels based on: Butler Manufacturing to indicate required standard. Materials of other manufacturers indicated by name in this Section are acceptable when approved by Engineer.
11. Profile: Thermawall.
    a. Fluted, 3.5 feet wide panel with corrugations at 8.5 inches on centers.
12. Panel depth:
    a. 2 inches, R-14 minimum.
13. Insulated Panels: Carry the following listings:
    a. Surface Burning Characteristics: Panel core (6 inches unfaced) tested in accordance with ASTM E84.
       1) Flame Spread: 25.
       2) Smoke Developed: 450.
14. Color:
    a. To be selected by Engineer (in consultation with Owner) from manufacturer's full range of primary and secondary colors.
15. Accessories:

a. Provide all accessories necessary for a weathertight building.
b. Accessories (doors and similar items): Suitable for wall panel system or framed openings and provided by metal building system manufacturer, unless otherwise indicated.

C. Metal Wall and Fascia Panels:
1. Steel.
a. Thickness: 26 Gage.
b. Finish: Factory-applied color coating.
1) PVDF Coating.
2) Smooth finish.
2. Length sufficient to cover entire height of unbroken wall up to 40 feet.
3. Roll-form panels with alternating box corrugations.
4. Interlocking panels.
5. Provide thermal blocking at connection to purlins or structural system.
6. Exposed fasteners.
7. Panel width: 3 feet.
8. Color:
a. To be selected by Engineer (in consultation with Owner) from manufacturer's full range of primary and secondary colors.
9. Accessories:
a. Provide trim accessories necessary for a weathertight building.

2.8 ACCESSORIES

A. Metal Pedestrian Doors and Frames:
1. Comply with Specification Section 08 11 13 - Hollow Metal Doors and Frames.
2. Sizes as shown or indicated on the Drawings.
3. Provide door hardware and accessories as indicated in the Contract Documents, including the Division 08 Specifications.
4. Provide trim to cover all exposed areas of door frames to match with the wall panels.

B. Gutters and Downspouts:
1. Sizes (minimum):
a. Gutters: 4 by 4 inches.
b. Downspouts: 3 by 5 inches.
c. Profiles:
1) Profiles in accordance with SMACNA Architectural Sheet Metal Manual.
2) Gutters: Style A.
3) Downspouts: From SMACNA Architectural Sheet Metal Manual, Figure 1-32F (closed) and Figure 1-32H (open at bottom for 24 inch).
2. Material
a. 24 gage steel.
3. Finish:
a. Corrosion protection treatment and final finish identical to that provided for roof panels.
b. Color shall match wall and roof panels.
1) Metal building manufacturer shall provide colored stock material to gutter and downspout Supplier as necessary for color matching requirement.
4. Expansion joints: Provide at maximum intervals of 150 feet but not less than one per side of building requiring gutters.

5. Provide downspouts to avoid downspout discharge to sidewalks, stoops, driveways, and similar surfaced areas.
6. Provide standard precast concrete splash block at each downspout location with the approximate size of 2.5 feet x 1 foot x 4 inches.

C. Snow Retention Systems:

1. Snow Retention Systems shall be provided and warranted by the Metal Building System manufacturer.
2. Provide mechanical non-penetrating system for sloped metal roof systems to prevent ice and snow from sliding off roof.
3. Components:
   a. Brackets (penetrating attachment):
      1) 6061-T6 aluminum extrusions in accordance with ASTM B221.
      2) Fasteners: 300 Series stainless steel.
         a) Screws for attachment of brackets best suited to application and roof type.
         b) Determined by the snow retentions system manufacturer.
   b. Cross Members:
      1) 6061-T6 aluminum extrusions in accordance with ASTM B221.
      2) Provide receptacle in face to receive color-matched metal strips.
      3) Provide splice connectors ensuring alignment and structural continuity at end joints.
   c. Color Strips:
      1) Same material and finish as roof panels; obtained from roof panel manufacturer.
   d. Snow and Ice Clips:
      1) Aluminum, with rubber foot, not less than 3 inches wide.
      2) Height as necessary for roof profile.
   e. Finish:
      1) Mill.
4. Performance Requirements:
   a. Provide snow guards to withstand exposure to the weather and environmental elements, and resist design forces without failure due to defective manufacture.
   b. Utilize a factor of safety greater than 2 to determine allowable loads from ultimate tested clamp tensile load values.
5. Installation:
   a. Provide clamps or brackets at spacing not greater than 2 feet-8 inches.
   b. Install snow guards starting 2 feet from the eave edge of the roof and extending uniformly upward and laterally over the entire roof area spaced at not more than 16 inches on centers in each direction.
   c. Fasten to roof surface in accordance with manufacturer's written instructions. Fasteners shall be compatible with roof panel system and shall not void roof warranties. Fasteners shall not damage panel finish.
6. Provide snow guards at locations shown or indicated on the Drawings.
7. Product and manufacturer: S-5! Metal Roof Innovations; Colorgard series, or equal.

D. Roof Penetration Flashing (Maximum 13 inch diameter):

1. Flashing material: EPDM rubber with aluminum sealing ring base.
2. Projection of weather surface above roof: Not less than 8 inches.
3. Configure flanges to match roof panel.

2.9 SOURCE QUALITY CONTROL

A. Tests and Inspections:

1. Perform and document results of Supplier's standard shop tests and inspections. Upon Engineer's request, submit documentation of successful completion of such tests and inspections.
2. Owner may, at Owner's option, employ a qualified, independent testing entity to inspect and test structural steel for compliance with the Contract Documents. When Owner elects to exercise such rights, Owner or Engineer will so advise Contractor not less than 10 days prior to shipment of structural steel components from Supplier's factory or place of fabrication and Supplier shall provide such testing and inspection entity with access to the factory or fabrication location. Costs for Owner-hired testing and inspection entity to travel to and from the factory or fabrication location and perform tests and inspections will be paid by Owner.
3. Contractor and Supplier are responsible for properly remedying defects in materials and equipment furnished prior to shipment of items from the factory or fabrication location.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installing the Work constitutes Contractor's approval of underlying work, substrates, and field conditions prevailing at the time of the Work.

3.2 INSTALLATION - GENERAL

A. Installation Requirements:

1. This Article indicates installation requirements general for metal building systems. Other articles in this "Part 3 – Execution" indicate additional, detailed requirements for installing specific elements or systems of the metal building systems.
2. Install items in accordance with the Contract Documents, manufacturer's written instructions, and Laws and Regulations. Where such requirements conflict, obtain interpretation or clarification from Engineer prior to commencing the associated Work.
3. Install metal building systems in accordance with the delegated design instruments of service Action Submittals approved by Engineer. However, such Submittals are not Contract Documents. Where Submittals approved by Engineer conflict with the Contract Documents, obtain interpretation or clarification from Engineer before commencing the associated metal building systems Work. Where necessary, Engineer may request information and advice from the metal building systems' delegated design professional; when such information or advice is necessary, Engineer's request will be through Contractor.
4. Properly and fully install and tighten all fasteners.
5. Provide base plates on grout layer. Unless shown or indicated otherwise elsewhere in the Contract Documents, grout layer shall be not less than 1-inch thick and, at the edges, neatly trimmed with a 1-inch vertical to 1-inch horizontal slope.
6. Install metal building systems straight, plumb, level, true, and free of rack, bowing, and sagging.

B. Interface with Other Work:

1. Comply with the "Coordination" provision in this Section's "Administrative Requirements" Article.
2. Anchor metal building systems to concrete foundation designed by Engineer in manner that does not result in exceedance of design loads of concrete foundation.
3. Where metal building system components will connect to other, existing construction, such as other buildings or structures, or mechanical equipment or systems, or electrical systems, provide at points of connection between metal building systems and such existing construction, equipment, or systems, appropriate flexible connectors. When such connectors are not expressly shown or indicated in the Contract Documents or delegated design instruments of service Action Submittals approved by Engineer, obtain interpretation or clarification from Engineer before commencing to make such connection.

C. Installation Tolerances:

1. Provide metal building systems in accordance with tolerances indicated in AISC 303, Code of Standard Practice.
2. Metal building system components straight, without bowing, sagging, or warping.

3.3 INSTALLATION – METAL ROOF SYSTEM

A. Metal Roof System Installation:

1. Install roof system weathertight.
2. Factory cut-to-length roof panels in accordance with Shop Drawings furnished by metal building system manufacturer.
3. Position and align roof panels to hold 3 foot module throughout building length.
    a. Position and align optional factory-punched roof panels by matching factory-punched holes in panels with factory-punched holes in roof structural members.
4. Install side laps with not less than one full corrugation.
5. End Laps:
    a. Not less than 6 inches.
    b. Fasten together over and to structural members.
6. Panel Side and End Laps: Seal with Butler Panlastic sealant, or equal, to prevent entry of capillary moisture.

3.4 INSTALLATION – METAL WALL SYSTEM

A. Metal Wall System Installation:

1. Install wall system weathertight.
2. Verify structural system is plumb before attaching wall panels.
3. Align and attach wall panels in accordance with Shop Drawings furnished by metal building system manufacturer.
4. Install side laps with not less than one full corrugation.
5. Seal wall panels at base with metal trim.
6. Flashings, Trim, Closures, and Similar Items: Install as indicated on Shop Drawings furnished by metal building system manufacturer.

3.5 INSTALLATION – OTHER ITEMS

A. Separate roof support member from the roof panel, except at each concealed structural fastener, with a spacer of material having a density of not less than 2 pounds per cubic foot and, if of a combustible material, having a flame spread rating not greater than 25.

B. Fasten roof panels to purlins or secondary support members in accordance with manufacturer's recommendations.

1. Completely seal airtight around building structural members and bracing when such members penetrate the liner panel.

3.6 FIELD QUALITY CONTROL

A. Field Tests and Inspections

1. Field Tests and Inspections by Contractor:
    a. Visually inspect metal building systems Work to verify proper installation in accordance with the Contract Documents.
    b. In presence of Engineer, perform field measurements to verify metal building systems are installed in accordance with required tolerances.
    c. Where necessary or requested by Engineer, perform appropriate field measurements to verify that metal building systems are installed straight, plumb, true, level, and free of rack, bowing, and sagging.

d. Submit to Engineer documentation of successful completion of Contractor's required field quality control, prior to requesting inspection for Substantial Completion of metal building systems.

e. Obtain from building code official having jurisdiction, and submit to Engineer, certificate of occupancy for metal building systems, where required by applicable building code or other Laws or Regulations.

2. Field Tests and Inspections by Others:

a. In accordance with Section 01 45 33 - Code-Required Special Inspections and Procedures, Owner will retain the services of qualified entity to perform code-required special inspections and tests. Results of such tests and inspections will be furnished to Contractor.

b. Special inspector and testing entity will:

1) Inspect field welding in accordance with AWS D1.1/D1.1M, Section 6 including the following non-destructive testing:

a) Visually inspect all welds.

b) Test 50 percent of full penetration welds and 10 percent of fillet welds with liquid dye penetrant.

c) Test 20 percent of full penetration welds with ultrasonic or radiographic testing.

2) Inspect high-strength bolting in accordance with RCSC Specification for Structural Joints, Section 9.

a) Inspect while metal buildings systems Work is in progress.

3) Inspect erected or installed structural steel.

4) Prepare and submit test reports to Engineer and Contractor.

B. Defective Work:

1. Promptly remedy defective Work to comply with the Contract Documents.

2. Where factory-applied or field-applied paint or coating is marred, scratched, or otherwise defaced, perform coating system manufacturer's recommended surface preparation and field-apply appropriate repair coatings as required.

C. Supplier's Services at the Site:

1. When metal building system Supplier is not also the Subcontractor installing the metal building systems, retain services of metal building system manufacturer's qualified, factory-trained representative to train and advise Contractor in unloading, handling, storing, and installing metal building system components.

2. When metal building system Supplier is the Subcontractor installing metal building systems Work at the Site, Subcontractor's workers shall include qualified, factory-trained representative responsible for ensuring metal building installation in accordance with the Contract Documents and related requirements.

3. Supplier shall assist installer with performing field quality control Work required of Contractor and assist Owner-retained special inspectors and testing entity in performing code-required special inspections and tests.

3.7 CLEANING, AND ADJUSTING

A. Comply with Section 01 74 23 – Cleaning and other requirements of the Contract Documents.

END OF SECTION

DIVISION 26

ELECTRICAL

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SECTION 26 00 10
ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Electrical General Requirements, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

C. Concrete Anchoring:

1. Cracked concrete is the baseline condition for the design of cast-in-place and post-installed anchors in alignment with both ACI 318 and International Building Code.

D. Drawing Use and Interpretation:

1. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except:
   a. Specific installation details.
   b. When specific dimensions are indicated for electrical equipment, it is intended that these be limiting dimensions. When proposed equipment exceeds these limiting dimensions, notify Architect. Features and functions of specified equipment shall not be superseded by these limiting dimensions.
2. For exact locations of building elements, refer to dimensioned architectural/structural drawings.
3. Field measurements take precedence over dimensioned drawings.
4. Intention is to indicate size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
5. Field verify locations and arrangement of existing systems and equipment.

E. Installation of systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.

1. No exceptions shall be made for submitted equipment that does not meet the physical dimension requirements of the originally specified equipment.

1.2 SYSTEM DESCRIPTION

A. Provide materials to provide systems in compliance with performance requirements specified.

B. Provide modifications required by reviewed shop drawings and field coordinated drawings.

C. Electrical equipment associated with mechanical and plumbing equipment connections including, but not limited to, overcurrent protection, feeder sizes, and starter and disconnect sizes, shall be coordinated with approved mechanical and plumbing shop drawings. Any revisions to electrical equipment as a result of approved mechanical and plumbing shop drawings shall be the responsibility of the Contractor. HDR shall not be responsible for issuing changes to drawings or specifications associated with these revisions. Contractor shall send a confirming RFI associated with any revisions so that HDR can acknowledge the change and confirm it is acceptable. The Contractor shall be responsible for documenting all revisions on the record drawings. Refer to Section 01 61 00 for additional information.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with but not limited to:

1. Federal, state and local codes, regulations and ordinances.
2. All authorities having jurisdiction.
3. Underwriters Laboratories, Inc. (UL) requirements.

4. Occupational Safety and Health Act (OSHA).
5. Factory Mutual System (FM) requirements.
6. International Building Code (IBC).
7. NFPA-70: National Electrical Code (NEC).
8. NFPA-70E: Standard for Electrical Safety in the Workplace.
9. NFPA-72: National Fire Alarm and Signaling Code.
10. NFPA-101: Life Safety Code.
11. ACI 318: Building Code Requirements for Reinforced Concrete.

1.4 SUBMITTALS

A. Product Data:

1. Concrete Anchors:
   a. Document Manufacturer Approval or Listing for cracked concrete application.
      1) Drop-in anchors are not cracked concrete rated and will not be allowed.

B. Contract Closeout Information:

1. Final performance test reports.

1.5 PROTECTION

A. Provide covering and shielding for equipment to protect from damage.

B. Protect nameplates on motors and similar equipment, to prevent defacing.

C. Repair, restore or replace damaged, corroded and rejected items.

D. Comply with manufacturer's storage, shipping and receiving requirements required to maintain full warranty.

1.6 JOB CONDITIONS

A. Examine Contract Documents to determine how other work will affect execution of electrical work. All work required for this coordination shall be included in bid.

B. Make arrangements for and pay for permits, licenses, and inspections.

C. Cause as little interference or interruption of existing utilities and services as possible.

1. Schedule work which will cause interference or interruption in advance with Owner, Architect, authorities having jurisdiction and affected trades.

D. Determine and verify locations of existing utilities on or near site.

1. Notify Engineer of any discrepancies prior to commencing work.

E. Temporary construction power and communications (See Division 01)

F. Record drawings:

1. Keep a complete set of electrical drawings in job site office for indicating actual installation of electrical systems and equipment.
2. Use this set of drawings for no other purpose.
3. Where any material, equipment, or system components are installed differently from that indicated, indicate differences clearly and neatly using ink or indelible pencil.
4. Drawings may be electronic if using an electronic redline or markup program and utilizing contract drawing files as a base.
5. At project completion, submit record set of drawings.

1.7 ENVIRONMENTAL CONDITIONS

A. General:

1. Provide NEMA 1 enclosures for electrical equipment unless otherwise indicated.

B. Conduit: See Section 26 05 33.

C. Cable: See Section 26 05 19.

D. Boxes and Fittings: See Section 26 05 34.

E. Damp and Wet Locations:

1. Exterior applications:
    a. Provide NEMA 3R enclosures for electrical equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Concrete Anchors:

1. Hilti.
2. Simpson Strong-Tie.
3. Powers Fasteners.

B. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Concrete Anchors:

1. Cast-in-place or post installed anchor approved for cracked concrete applications.
    a. Note: Drop-In Anchors shall not be used.

B. Material and Equipment:

1. Current and standard design of manufacturers regularly engaged in their production.

C. Where UL approval or listing is required in electrical specifications, suitable approval or listing from other nationally recognized testing laboratory (NRTL) is acceptable.

D. Use UL labeled electrical materials and fabricated assemblies.

E. Structural Steel for Supports:

1. ASTM A36.
2. Galvanize members installed in areas of high humidity or condensation.
3. Furnish other members with shop coat of rust inhibiting primer.
4. Shop fabricate for field assembly using bolts.
5. Minimize field welding.
6. Retouch primer and galvanizing after field welding.
7. Unless support is otherwise indicated where weight of equipment exceeds 400 pounds, submit engineering design and calculations signed and sealed by a registered Engineer licensed to practice Structural Engineering in the state in which the project is located.

F. Concrete Anchors:

1. Cast-in-place or post installed anchor approved for cracked concrete applications.
    a. Note; Drop-In Anchors SHALL NOT be used.

PART 3 - EXECUTION

3.1 GENERAL

A. When changes in location of any work are required, obtain approval of Architect before making change.

B. Do not change indicated sizes without written approval of Architect.

C. Provide offsets and crossovers in conduits, raceways, cable trays and ducts.

3.2 CUTTING AND PATCHING

A. Provide cutting, fitting, repairing, patching and finishing of installed work.

1. Include installed work of other sections where it is to disturb such work to permit installation of electrical work.
2. Repair or replace existing or new work disturbed.

B. Avoid cutting, where possible, by setting sleeves or frames, and by requesting openings in advance.

C. Before cutting, obtain approval of Structural Engineer.

1. Use only approved methods.
2. Cut holes approved by Engineer neatly to admit work.
3. Do not weaken walls or floors; locate holes in concrete to avoid structural members.

D. Locate openings and sleeves to permit neat installation of conduits and equipment.

E. Do not remove or damage fireproofing materials.

1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
2. Repair or replace fireproofing removed or damaged, at no extra cost.

F. See Section 01 73 29.

3.3 INSTALLATION

A. Install equipment in accordance with manufacturer's recommendations.

B. Anchoring Devices and Supports.

1. Use anchoring devices and structural supports suitable for equipment and install in accordance with manufacturer’s recommendations.
2. Check loadings and dimensions of equipment with shop drawings.
3. Do not cut, or weld to, building structural members.
4. Provide equipment supports even though not detailed on architectural and structural drawings.

C. Verify equipment will fit support layouts indicated.

D. Provide boxes, sleeves and devices for installation.

E. Make penetrations through roofs prior to installation of roofing.

F. For penetrations required after installation of roofing:

1. In built-up roofing (BUR), provide curbs, cants and base flashings.
2. In elastic sheet roofing (ESR), arrange and pay for flashing work by authorized roofer.

G. Install rain hoods and metal counter flashings as indicated and make penetrations of electrical work through walls and roofs water and weathertight.

1. Furnish clamps, waterproofing material and labor.
2. Where metal flashings are applied over concrete, paint concrete with 3 mm 1/8 inches of mastic cement first.
3. Set flashing in mastic cement, watertight.

H. Have repair and replacement of roof construction, damaged by this work, done in manner which will not nullify roof warranty.

I. Install equipment to permit easy access for normal maintenance.

1. Maintain easy access to switches, motors, drives, pull boxes, receptacles, etc.
2. Relocate items which interfere with access.

J. Provide concrete foundations (isolation pads) or housekeeping pads for floor mounted electrical equipment as follows unless otherwise indicated:

1. Install nominal 100 mm 3.5 inches high concrete housekeeping pads. Outside dimension of pad shall be at least 100 mm 3.5 inches larger in all directions than base of equipment or 228 mm 9 inches from center of anchor, whichever is greater.
2. Use 20.7 MPa 3,000 psi concrete.
3. Reinforce with No.13 No.4 bars, 300 mm 12 inches on-center each way, with short No.13 No.4 dowels into floor at 600 mm 24 inches on-center each way.
4. Top surface shall be level. The use of shims underneath equipment is strictly prohibited.
5. Chamfer top edges 20 mm 3/4 inches.
6. Make faces smooth.
7. Set anchor bolts for equipment.

3.4 PAINTING

A. See Section 09 91 13.

3.5 FIELD QUALITY CONTROL

A. Perform indicated tests to demonstrate workmanship, operation, and performance.

1. Conduct tests in presence of Architect and, if required inspectors of agencies having jurisdiction.
2. Arrange date of tests in advance with Architect, manufacturer and installer.
3. Give minimum of 24 hours notice to inspectors.
4. Furnish or arrange for use of electrical energy, steam, water, diesel fuel, or gas required for tests.
5. Furnish lubricating materials required for test.

B. Repair or replace equipment and systems found inoperative or defective and retest.

1. If equipment or system fails retest, replace it with products conforming with Contract Documents.
2. Continue remedial measures and retests until satisfactory results are obtained.

C. Test equipment and systems as indicated for each item, unless otherwise recommended by manufacturer.

3.6 FINAL PERFORMANCE TEST

A. Perform panel load balance, short circuit, and freedom from ground, and ground test (including ground fault protection where provided).

1. As part of putting systems in operation, provide tabulated results of load balance and voltage at each switchboard, panelboard and motor control center. Use true RMS measuring metering devices.
2. Provide neutral to ground resistance tests to prove neutral is grounded in only one location.
3. Provide ground test at service entrance and provide report on resistance to earth of the grounding electrode system.
4. See individual specifications for additional testing and commissioning.

3.7 ADJUST AND CLEAN

A. Inspect equipment and put in good working order.

B. Clean exposed and concealed items.

C. Where new work occurs in existing areas where no other work has been done, clean area and restore to original condition.

3.8 PUTTING SYSTEMS IN OPERATION - START-UP

A. Put systems into satisfactory operation prior to final acceptance, at time agreed to by Construction Manager, Owner and Architect.

B. Operate systems in good working order for period of 5 working days.

3.9 DEVICE MOUNTING

A. See symbol legend for device mounting heights unless otherwise noted.

1. Mounting heights indicated on legend shall supersede Architectural and Interiors elevations.

B. Dimensions are to center of device unless otherwise indicated.

C. All light switches and/or lighting control wall stations shall be mounted within 12 inches measured horizontally from the door frame or wall opening used to enter the space.

D. Coordinate device locations with equipment/furnishings abutting walls such as, but not limited to, architectural millwork, casework, lockers, mirrors, and equipment. Refer to architectural and casework/equipment elevations to facilitate coordination of device placement. Devices shall be relocated at Contractor's expense if conflict exists after installation.

E. Locate exit signs and fire alarm flashing lights so that all are visible from corridor locations. Relocate and/or add signs as required to resolve conflicts.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Low Voltage Electrical Power Conductors and Cables, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

C. Low voltage to include all systems with line voltage of 0 volts to 600 volts.

1.2 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Splices and taps for smaller than No.6 AWG wire:

1. Base:
    a. 3M.
    b. Ideal Electric.
    c. Heyco Molded Products.
    d. Elastimold.
    e. Buchanan Construction Products.

B. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Wire: Single conductor, soft drawn, copper wire with 600 volt insulation, UL listed.

1. For feeders and branch circuits as defined by NEC: Type THWN/THHN or XHHW-2.
2. For exterior feeder and branch circuits as defined by NEC: Type XHHW-2.
3. For branch circuits served by GFCI circuit breakers: Type XHHW-2.
4. For line voltage of 100 volts and larger: Use no wire smaller than No.12 AWG, except as follows:
    a. Smaller size wire may be used only where specifically indicated.
5. Size conductors to match over current/overload protective device unless larger conductors are indicated.
6. No.10 and smaller wire: Solid conductor.
7. No. 10 AWG conductor to be used for 20 ampere, 120V circuits exceeding 30 M 100 feet.
8. No. 10 AWG conductor to be used for 20 ampere, 277V circuits exceeding 60 M 200 feet.
9. Power and communication connections to motors and to generators shall be with stranded conductors.
10. Grounding conductors shall be insulated, unless installed exposed in plenum spaces or otherwise noted.

B. For line voltage of 0 to 30 volts for lighting control/signal circuits: Use no wire smaller than No. 18 AWG.

1. Wire gauge shall be increased up to No. 14 AWG where voltage drop is a concern.
2. Wire shall be a shielded twisted pair with stranded copper conductors.
3. Minimum insulation value shall be 300V for Class 2 circuits and 600V for Class 1 circuits.

C. Splices and taps for smaller than No.6 AWG wire:

1. 3M, "Scotchlok" or "Hyflex".
2. Ideal "Wingnut" or "Wirenut".
3. Heyco.
4. Elastimold insulated conical spring-type connectors.

D. Splices and taps for No.6 AWG wire and larger: Use compression connectors with pre-stretched insulation to equal insulation of wire being spliced.

E. Splices and taps - General: Do not make splices and taps with crimp or indenter-type connectors.

F. Pulling lubricant: Do not use cable pulling lubrication compound containing petroleum or other products which may deteriorate insulation.

G. Color-coding: Color code conductors in accordance with NEC as follows:

1. Color code all wiring.
2. Use the color-coding schedule within Section 26 05 53.
3. Color-coding of conductor ends only will be acceptable for feeder phase conductors.
4. Color-coding of conductor ends only will be acceptable for neutral and grounding conductors number 4 AWG and larger.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wiring in conduit unless otherwise indicated.

B. Install no more than 3 phase conductors in one conduit.

C. Provide a separate neutral conductor for each phase conductor in receptacle branch circuits, appliance branch circuits, and lighting branch circuits.

D. When more than three current-carrying conductors (which includes separate neutral conductors for single phase circuits) are installed in a single conduit, wiring shall be derated in accordance with NEC 310.15.

E. Run panelboard and motor feeders in individual conduits.

F. Conductors not noted on plan shall be sized to overcurrent protective device feeding circuit. See feeder schedule on plans for requirements.

G. Lighting control cabling:

1. 0-10V control wires shall be allowed to be routed in the same conduit as line voltage wires (in a Class 1 configuration) when routed from fixture to fixture (and to area lighting controller(s) as applicable) within a room, provided that the 0-10V wire insulation meets NEC requirements.
2. When 0-10V wires are routed between rooms or if the cable length exceeds 50 feet, wires shall be routed in a Class 2 configuration as follows:
   a. When above an accessible ceiling and concealed from view, 0-10V wires may be routed on the outside of the line voltage conduit and attached to conduit via Velcro cable straps.
   b. When routed in an exposed ceiling or above an inaccessible ceiling, 0-10V wires shall be routed in their own dedicated conduit.

H. Underground conductors shall not be spliced.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, tools, equipment, and services for Grounding and Bonding for Electrical Systems, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. ASTM International (ASTM):
    a. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
2. Institute of Electrical and Electronics Engineers (IEEE):
    a. 837, Qualifying Permanent Connections Used in Substation Grounding.
3. National Fire Protection Association (NFPA):
    a. 70, National Electrical Code (NEC).
4. Underwriters Laboratories, Inc. (UL):
    a. 467, Electrical Grounding and Bonding Equipment.

B. Assure ground continuity is maintained throughout the entire Project.

1.3 SUBMITTALS

A. Shop Drawings:

1. Fabrication and/or layout drawings:
    a. Plan drawings showing type, size and locations of all grounding system components.

B. Product Data:

1. Manufacturer’s specifications and evidence of required approvals for all materials and components.

C. Miscellaneous:

1. Ground rod and/or grounding system resistance and continuity test reports signed by the Project’s supervising electrical foreman.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Ground rods and bars and grounding clamps, compression connectors and lugs:
    a. Burndy.
    b. Harger Lightning Protection.
    c. Heary Brothers.
    d. Joslyn.
    e. Robbins Lightning Protection.
    f. Blackburn.
    g. Thompson.

2. Exothermic weld connections:
    a. Erico Products Inc., Cadweld.
    b. Harger Lightning Protection.
    c. Thermoweld.
3. Inspection test well:
    a. Erico.
    b. Quazite Composolite.
    c. Armorcast Products Company.

B. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 COMPONENTS

A. Wire and Cable:

1. Bare conductors: Soft drawn tinned stranded copper.
2. Insulated conductors: Same as bare conductors with XHHW insulation, color coded green.

B. Vault and Equipment Room Ground Bus Bars:

1. Solid copper:
    a. 1/4 inches thick.
    b. 4 inches wide.
    c. Length as indicated on drawings, or 24 inches minimum.
2. Predrilled grounding lug mounting holes in NEMA standard 2-hole patterns.
3. Stainless steel or galvanized steel mounting brackets.
4. Insulated standoffs.

C. Ground Rods:

1. 3/4 inches x 10 feet.
2. Copperclad:
    a. Heavy uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
    b. Corrosion resistant bond between the copper and steel.
    c. Hard drawn for a scar-resistant surface.

D. Mechanical connectors:

1. UL 467.
2. Permitted only where specifically indicated or specified.

E. Grounding Connectors and Lugs:

1. Compression type:
    a. Standards: UL 467 and IEEE 837.
    b. High copper alloy content.
    c. Non-reversible.
    d. Terminals for connection to bus bars shall have two bolt holes.

F. Piping, tubing and Conduit Clamps:

1. High-copper alloy cast U-bolt fitting.
2. 90 degree lay-in cable clamp.
3. Burndy Type GAR.

G. Exothermic Weld Connections:

1. Copper oxide reduction by aluminum process.
2. Molds properly sized for each application.

H. Conduit: See Section 26 05 33.

I. Grounding type insulated bushings: See Section 26 05 33.

J. Inspection test well:

1. 12 inches H x 12 inches W x 12 inches L.
2. Single piece polyolefin body.
3. Removable top cover with “GROUND” wording clearly visible.
4. Tier 15 Design Load of 15,000 pounds.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install products in accordance with manufacturer's instructions.
2. Size grounding conductors and bonding jumpers in accordance with NFPA 70 Article 250, except where larger sizes are indicated on the Drawings.
3. Remove paint, rust, or other non-conducting material from contact surfaces before making ground connections.
4. Where ground conductors pass through floor slabs or building walls provide non-metallic sleeves and install per Section 26 00 10.
5. Do not splice grounding conductors except at ground rods.
6. Install ground rods and grounding conductors in undisturbed, firm soil.
    a. Provide excavation required for installation of ground rods and ground conductors.
    b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
    c. Unless otherwise specified, make all splices, taps and connections with compression type connectors or exothermic welds.
    d. Provide sufficient slack in grounding conductor to prevent conductor breakage during backfill or due to ground movement.
    e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.
7. Do not use exothermic welding if it will damage the structure to which the grounding conductor is being welded.

B. Grounding Electrode System:

1. Provide a grounding electrode system in accordance with NFPA 70 Article 250 and as indicated on the Drawings.
2. Grounding conductor terminations:
    a. Ground bars mounted on wall, use compression type terminal and bolt it to the ground bar with two bolts.
    b. Ground bus in electrical equipment, use compression type terminal and bolt it to the ground bar.
    c. Piping systems, use mechanical type connections.
    d. Building steel, below grade and encased in concrete, use compression type connector or exothermic weld.
    e. Install grounding jumper of same size around water meter and interconnection valves using ground clamps.
    f. At above grade terminations, label the conductors per Section 26 05 53.

C. Main Switchboard Ground:

1. Install main grounding conductor in steel conduit and connect to grounding electrode system using an exothermic weld or UL listed compression fitting.
    a. Unless otherwise indicated, install main ground unspliced in exposed conduit.
    b. Make connections easily accessible for inspection, not underground or concealed in floors or walls.
2. Bond grounding conductor to conduit at entrance and exit, of same type and quality as other conductors in building.
3. Locate neutral ground disconnecting link or links in main switchboard so that low-voltage neutral bar with interior secondary neutrals can be isolated from common equipment grounding bus.

D. Raceway Bonding/Grounding:

1. Metallic conduit shall be installed so that it is electrically continuous.
2. All conduits to contain a grounding conductor with insulation identical to the phase conductors, unless otherwise indicated on the Drawings.
3. NFPA 70 required grounding bushings shall be of the insulating type.
4. Provide double locknuts at all pullboxes and equipment entries.
5. Bond conduit, at entrance and exit of equipment, to the equipment ground bus or lug.
6. Make metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.

E. Exposed Metallic Conduit Grounding:

1. Low voltage circuits: Threaded grounding bushing.

F. Ground all neutral conductors, conduit systems, cabinets, equipment, motor frames, etc., in accordance with NEC and applicable codes.

3.2 DISTRIBUTION

A. Make metallic raceway fittings and grounding clamps tight to ensure that equipment grounding system will operate continuously at ground potential to provide low impedance current path to insure proper operation of overcurrent devices during possible ground fault currents.

B. Do not solder grounding circuit connections.

C. Provide each conduit with grounding type insulated bushing where metallic conduits terminate without mechanical connection to metallic housing (switchboards, motor control centers, etc.).

1. Connect each bushing to grounding bus in equipment with bare copper conductor.

D. In nonmetallic conduits or ducts, maintain continuity of equipment grounding system by bar or conductor installed and connected by approved method to conductive noncurrent-carrying equipment at both ends.

E. Ground all conduit, panelboards, receptacles, accessible fixtures, switchgear, transformers, motors, and motor equipment.

F. Make ground continuity positive throughout entire project.

3.3 FIELD QUALITY CONTROL

A. Provide a continuity test on the components of the grounding electrode system.

B. Complete grounding system: Resistance of 5 ohms or less.

C. Test resistance of installed ground system after backfilling and before connection to any other grounded system including underground piping, utility services or other building ground systems.

1. Test ground grid resistance by fall-of-potential method.
2. Perform test at the main ground bar.

END OF SECTION

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SECTION 26 05 33
CONDUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Conduits, as indicated, in accordance with provisions of Contract Documents.

B. Conduit runs are diagrammatic. Verify and coordinate locations in field.

C. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Electrical Components, Devices, and Accessories shall be listed and labeled in accordance with NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Certifications:

1. Conduit: Stamp each length with name or trademark of manufacturer and affix UL label.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer's data for each product specified.
2. IBC Certificates of Compliance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. As noted for each type listed below.

B. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Rigid Metal Conduit (RMC):

1. Manufacturers:
   a. Base:
      1) Allied Tube and Conduit Corp.
   b. Optional:
      1) Republic Conduit
      2) Wheatland Tube
2. Materials
   a. Hot dipped galvanized, or sherardized, including threads.
   b. Standard pipe thread with coupling; deliver with thread protector and end caps.
   c. Standards:
      1) NEMA/ANSI C80.1 – Electrical Rigid Steel Conduit – Zinc Coated (ERSC).
      2) UL 6 - Electrical Rigid Metal Conduit – Steel.

B. Intermediate Metal Conduit (IMC):

1. Manufacturers:
   a. Base:

1) Allied Tube and Conduit Corp.

b. Optional:

1) Republic Conduit.

2) Wheatland Tube.

2. Materials

a. Intermediate metal conduit (IMC): Hot dipped galvanized steel of intermediate wall thickness including threads.

b. Standard pipe thread with coupling; deliver with thread protector and end caps.

c. Standards:

1) NEMA/ANSI C80.6 –Electrical Intermediate Metal Conduit (EIMC).

2) UL 1242 - Standard for Electrical Intermediate Metal Conduit – Steel.

C. Liquid-Tight Flexible Metal Conduit (LFMC):

1. Manufacturers based on specification compliance:

a. Base:

1) Anamet Electrical.

b. Optional:

1) Electri-Flex.

2) AFC.

3) International Metal Hose.

2. Materials

a. Liquid-tight Flexible Metal Conduit (LFMC): Steel, hot dipped galvanized with PVC jacket.

b. Standards:

1) UL 1660 – Standard for Liquid-Tight Flexible Nonmetallic Conduit.

D. Rigid Polyvinyl Chloride Nonmetallic Conduit (PVC):

1. Manufacturers:

a. Base:

1) Carlon.

b. Optional:

1) Allied.

2) Cantex

2. Materials

a. Rigid Polyvinyl chloride (PVC): Schedule 40 or 80, meeting minimum requirements of NEC.

b. Standards:

1) UL 651 - Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings.

2) NEMA TC-2 and TC-3 – Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.

E. Conduit Fittings:

1. Manufacturers:

a. Base:

1) Appleton Electric.

b. Optional:

1) Cooper Crouse-Hinds.

2) Killark.

3) Thomas & Betts.

4) O-Z/Gedney.

2. Materials
   a. Standards:
      1) ANSI/NEMA FB-1 – Fittings, Cast metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
      2) UL 514B - Conduit, Tubing, and Cable Fittings.
   b. RMC Fittings
      1) Threaded cast ferrous alloy with corrosion resistant finish. Cast body with gasketed corrosion resistant screw cover and threaded hubs.
      2) Not Approved: Zinc alloy and similar soft metal die castings.
   c. IMC Fittings:
      1) Threaded cast ferrous alloy with corrosion resistant finish. Cast body with gasketed screw cover and threaded hubs.
      2) Not Approved: Zinc alloy and similar soft metal die castings.
   d. PVC Conduit Fittings:
      1) PVC plastic solvent weld type, with threaded adapters as required.
   e. Bushings:
      1) Threaded, galvanized, malleable iron.
      2) Bushings for conductors No.4 and larger: Separate insulated bushings.
         a) Do not use insulated throat connectors.
      3) Grounding bushings: With screw termination for green grounding wire.

F. Expansion Fittings:
   1. Manufacturers:
      a. Base:
         1) Cooper Crouse – Hinds.
      b. Optional:
         1) O-Z/Gedney.
         2) Appleton Electric.
   2. Materials
      a. Description:
         1) Watertight deflection type cast slip joint fitting for conduit, with flexible bonding conductor for continuity of ground through metallic conduit.
      b. Design Standards:
         1) O-Z/Gedney: Type DX.
         2) Cooper Crouse – Hinds: Type XJG.

G. Inserts and Attachments:
   1. Select inserts and attachments to suit loading conditions.
   2. Inserts For Placement in Concrete Formwork:
      a. Malleable iron, wedge with nut, galvanized finish.
      b. Size inserts to suit threaded hanger rods.

H. Supports, Sleeves and Seals:
   1. Conduit supports:
      a. Standards:
         1) UL 2239 - Hardware for the Support of Conduit, Tubing, and Cable.
         2) Listed and in compliance with other applicable standards.
      b. Designed specifically for electrical installations.

c. Hangers:
1) Steel zinc-nickel plated threaded rods with straps or clamp conduit holder.
d. Straps:
1) One-hole and two-hole malleable iron, hot-dipped galvanized or steel, zinc-nickel or zinc plated.
e. Beam Clamps:
1) Malleable iron, hot-dipped galvanized or zinc-nickel plated.
f. Channels and Fittings:
1) Channels: Hot-dipped galvanized.
2) Fittings: Galvanized.
g. Trapeze assemblies:
1) Constructed from channels and supported by at least two threaded rods attached to building structure.

2. Sleeves:
a. Black iron pipe, RMC or IMC sized to accommodate work passing through.
3. Sealer for sleeves and openings around conduit:
a. UL listed for assembly.
b. See Section 07 92 13.
4. Sealer for use inside conduits:
a. Manufacturers:
1) Base:
a) Arnco.
2) Optional:
a) Polywater .
b. Materials
1) Description:
a) Watertight / Airtight foam sealant for electrical conduit.
b) Listed for application with electrical wiring and conduit.
2) Design Standards:
a) Arnco: Hydra-Seal.
b) Polywater: FST Duct Sealant.

I. Ductbank Accessories:
1. Manufacturers:
a. Base:
1) Cantex.
b. Optional:
1) Carlon.
2) GS Industries
3) Thomas & Betts.
2. Conduit supports:
a. Shall be designed specifically for electrical installations.

PART 3 - EXECUTION

3.1 SCHEDULE OF CONDUIT UTILIZATION

A. Use no conduit smaller than 13 mm 1/2 inches.

B. Size conduit in accordance with NEC unless indicated larger.

C. Rigid Steel Conduit (RMC) or Intermediate Metal Conduit (IMC) shall be used in following locations unless otherwise noted:

1. Outdoors exposed.
2. In wet locations.
3. For exposed interior runs below 3050 mm 10 feet above finished floor unless otherwise indicated.
4. For feeders over 600 volts.

D. Liquid-tight flexible metal conduit (LFMC) shall be used for applications including, but not limited to:

1. All damp and wet locations.
2. For connection to equipment subject to vibration.

E. Rigid polyvinyl chloride nonmetallic conduit (PVC) may be used subject to following:

1. Do not use exposed PVC conduit unless otherwise noted.
2. Provide a 600 volt, insulated, green grounding conductor in each PVC conduit.
   a. Power circuits: Proper ampacity per NEC.
3. 45 degrees and greater bends in PVC conduit runs larger than 1-1/2 inches shall be made with rigid steel conduit.
4. Schedule 80 PVC conduit may be used as follows:
   a. Routing of grounding electrode system conductors below and above grade and stubs through concrete slabs on grade.
5. Direct-burial Schedule 40 PVC or concrete-encased Type EB may be used as follows:
   a. Exterior Lighting: See Section 26 56 00.
   b. Underground and concrete encased conduits over 600 volts.
   c. Service entrance conductors.
   d. For 600 volts and below:
      1) Underground and concrete encased conduits 600 volts and below for feeders and branch circuits.

3.2 INSTALLATION - GENERAL

A. Provide separate conduit systems for all lighting, power, and communications systems, unless otherwise indicated.

1. Separate systems of different branches of power.
2. Separate systems of different voltage classes into different conduit systems unless otherwise noted.
   a. Do not combine 208/120 and 480/277V wiring in common wireways or pull boxes.
3. Provide dedicated junction boxes and pull boxes to separate wiring systems.

B. Where practical, group home runs to same panelboard.

1. Do not enclose more than three single phase circuits or one three phase circuit in one raceway unless noted otherwise.

C. Only nylon or polyethylene rope shall be used to pull wire and cable in conduit systems.

D. Protect inside of conduit from dirt and debris during construction by capping openings with tapered plugs or plastic caps.

1. If moisture or debris gets into conduit remove before wire is drawn into place.

E. Make conduit field cuts square and ream to full size.

1. Shoulder conduit in couplings.

F. Sum of angles in any power conduit run shall not exceed 360 degrees.

G. Provide conduit bodies, junction boxes, or pull boxes when the maximum number of bends have been exceeded.

1. Covers shall be accessible.
2. Conduit bodies for power circuits may be used as follows:
    a. On exposed runs at junctions, bends, or offsets where splices are not required.
    b. Around outside corners of walls and equipment or around beams.
    c. Conduit bodies are not allowed for use with conduits containing telecommunication cables.

H. Empty conduits:

1. Install 5mm 3/16 inches minimum diameter polypropylene or nylon pull-line from end to end with tag at each end designating opposite terminus.

I. Make joints in threaded conduit watertight with white nonleaded compound applied to male threads only.

1. Cut square, ream smooth, and properly thread field joints to receive couplings.
2. Do not use running threads.

3.3 INSTALLATION OF CONDUIT ABOVE GRADE

A. Run conduit in straight lines at right angles to or parallel with walls, beams, or columns.

B. Provide conduit support designed for building structural conditions to carry load imposed.

C. Provide inserts or fasteners to attach hangers to structure.

1. Attachment to metal roof deck may be by means of pre-punched tabs, pre-punched holes, or with screws in sides of ribs or toggle bolts in bottom of ribs.
2. Space hangers in joints between precast units minimum 100 mm 4 inches from walls.

D. Use trapeze assemblies to support multiple conduits.

1. Coordinate layout to provide adequate access to cable tray assemblies if applicable.

E. Installation of conduit or rack of conduits shall not interfere with placement of specified luminaire.

F. Hangers in roof deck:

1. Do not extend above tops of ribs, or otherwise interfere with vapor retarder, insulation, or roofing.

G. Independently support conduit systems from building structure or walls with approved hangers.

1. Do not use following to support conduit:
    a. Wire including ceiling support wires.
    b. Perforated strap hangers.
    c. Plastic or nylon tie wraps.

H. Support suspended conduits within 300mm 12 inches of any change of direction of 45 degrees or greater.

I. Neatly seal openings around conduits, etc., where they pass through fire rated construction or exterior walls or roof. Provide proper rated seal for fire-rated penetrations.

J. No exterior horizontal roof supported conduit runs are permitted in lengths exceeding 6 feet unless indicated otherwise.

K. Conduit stub-outs:

1. Terminate conduit with insulating bushing.

L. Install rigid conduits squarely into boxes.

1. Rigidly clamp to box with locknut on outside and inside and provide bushing on inside.

M. Fit all conduit ends at switch and outlet boxes with approved lock nuts and bushing forming approved tight bond with box when screwed tightly in place.

N. Provide expansion joint fittings as follows:

1. On conduit at all building expansion or control joints where conduit is rigidly attached to structure.
2. Where necessary to compensate for thermal expansion and contraction.
3. Flexible metal conduit may be used for expansion fittings on runs smaller than 1 inch where exposed or concealed above suspended ceilings.
    a. Leave slack in conduit for movement.
    b. Fasten on each side of joint.

O. Provide junction box with duct-seal on raceways subject to different temperatures including but not limited to:

1. Conduits passing from interior to exterior of structure.
2. Conduits serving cold storage rooms, freezers, and refrigeration equipment.

3.4 INSTALLATION OF CONDUIT WITHIN OR THROUGH STRUCTURAL ELEMENTS

A. Conduit shall not be installed within structural elements, i.e. concrete columns, beams, decks, or slabs unless otherwise noted.

B. Conduit passing through concrete wall or slab penetrations:

1. All core drilling, sleeves, block-outs, and other penetrations must be approved by Structural Engineer prior to installation.
2. Space sleeves and core drills to ensure minimum of three (3) times nominal trade diameter of largest adjacent conduit between sleeves or core drills.
3. Use block-outs for concentrations of conduits in confined area.

3.5 INSTALLATION OF CONDUITS IN BELOW GRADE, NON-CONCRETE ENCASED DUCTBANKS

A. Minimum size of underground conduit shall be 20 mm 3/4 inches.

B. Maintain depth of conduit at least 762mm 30 inches below finished grade.

1. Remove materials from trench that could damage conduit.
2. Use sand or selected material for bedding and first layer of backfill.

C. Provide minimum separation of 300 mm 12 inches of concrete or compacted dirt between communications systems conduits and power systems conduits operating at 100 volts or greater when conduits follow parallel path.

D. For steel conduits in contact with earth or a vapor retarder, coat with 2 coats asphalt emulsion before installation, or use PVC coated steel conduit.

E. Use long radius bends and deflection couplings for changes in direction.

1. Maintain a minimum radius of 914mm 36 inches.

F. Tighten taper-fit joints with light blows of a sledgehammer.

1. Dope threaded joints and tighten with tool.
2. Seal plastic joints around entire perimeter with chemical bonding agent.

G. Cap empty conduit.

1. Seal ends with approved waterproofing compound after conductors have been installed.

H. Provide rigid steel conduit elbows where non-metallic conduit emerges from underground, with threaded adapters for change of material.

1. Provide 914mm 36IN minimum radius or larger elbows as required by local utility company.

I. Conduits stubbed into manholes:

1. Terminate metal conduit with insulating bushing.
2. Terminate non-metallic conduit with bell ends.

J. Do not place backfill until work is inspected and approved.

K. Provide identification for underground conduits.

1. Use warning tape for direct-buried conduits.
2. For warning tape, backfill trench to within 305mm 12 inches of finished grade.
3. Install tape continuously along entire length of trench, and complete backfill operation.

L. All conduit stub-outs on site shall be identified in one of following ways and noted on as-built drawings provided to Owner:

1. Cap conduits indicated to be stubbed out underground with glued-on PVC caps.
2. Permanently marked.
3. Dimension from landmark on site or building.
4. Using a Global Positioning System (GPS) device accurate to within 6 inches.

END OF SECTION

SECTION 26 05 34
BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Boxes, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. UL 514A – Metallic Outlet Boxes.
2. ANSI/NEMA FB-1 – Fittings, Cast metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
3. ANSI/SCTE 77 Specification for Underground Enclosure Integrity.

1.3 SUBMITTALS

A. Product Data:

1. Describe configurations, finishes, colors, and dimensions for the following:
   a. Ingrade splice boxes.
   b. Special mounting boxes and covers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Galvanized Outlet Boxes and Fittings:

1. Base:
   a. Hubbell Electrical Products – RACO.
2. Optional:
   a. Emerson Industrial – Appleton Electric.
   b. Thomas & Betts –Steel City.

B. Corrosion Resistant Boxes:

1. Crouse Hinds.
2. Robroy.

C. Wet Location Boxes/Covers:

1. Base:
   a. Hubbell.
2. Optional:
   a. Thomas & Betts.
   b. Robroy.

D. Box Supporting Brackets:

1. Base:
   a. Hubbell/RACO.
   b. Erico/Caddy.

E. Ingrade Splice and Pull Boxes:

1. Base:
    a. Hubbell Quazite.

F. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 WALL OUTLET BOXES

A. General:

1. Minimum Size.
    a. 100 mm 4 inches square or octagon.
    b. Depth as required.
2. Lighting outlet boxes.
    a. Galvanized.
    b. Use extension and plaster rings as required.
    c. Verify proper depth with partition thickness.
    d. Provide with proper fittings to support and attach luminaires.
    e. Support outlet boxes for luminaires and other ceiling mounting devices in lay-in acoustical tile ceilings by bar hangers anchored to ceiling construction members which do not interfere with tile removal.
3. Switch and receptacle boxes for concealed wiring.
    a. Galvanized.
4. Pull and junction boxes.
    a. Galvanized steel, code gauge.
    b. Cover:
        1) Same material as box, screw-on type.
5. Boxes for 277 volt switches on opposite phases.
    a. Where multi-ganging boxes, provide barriers per NEC.
6. Extension Rings.
    a. To suit conditions.
7. Hardware.
    a. Grounding screw and connectors as required by wiring method.
8. Supports.
    a. Box supporting brackets.
        1) Caddy MEB1 and SGB Series.
    b. Far side box support.
        1) Hubbell/RACO Model No. 978.
        2) Erico Model No. 766.
        3) Caddy Model No. J1A35.

B. Weatherproof box and cover (mounted to building):

1. Box:
    a. Corrosion resistant cast malleable iron type, with threaded hubs and neoprene gasket.
    b. Design basis: Crouse-Hinds Type FS.
2. Cover for damp locations:
    a. Suitable for damp location when receptacle is in use.
    b. Gasketed and self-closing, zinc die cast, gray, lift cover.
        1) Single outlets: Hubbell RW51550.
        2) Duplex outlets: Hubbell RW51470.
        3) Duplex GFCI and USB receptacles: Hubbell RW51040.

3. Cover for wet locations:
    a. Suitable for wet location when receptacle is in use.
    b. Die-cast aluminum construction, meets extra-duty rating in UL 514D.
    c. Padlockable, gasketed NEMA 3R cover.
        1) Single outlets: Hubbell WP700E.
        2) Duplex outlets: Hubbell WP26E with duplex adapter.
        3) Duplex GFCI receptacles: Hubbell WP26E.

2.3 INGRADE SPLICE AND PULL BOXES

A. Polymer concrete, PC Style gasketed boxes,; with solid base.

B. Size.

1. 6 inches width x 8 inches length x 6-3/4 inches depth.
2. 8 inches width x 18 inches length x 8 inches depth.
3. 11 inches width x 18 inches length x 12 inches depth.
4. 12 inches width x 12 inches length x 12 inches depth.

C. ANSI/SCTE 77 Tier Load Rating.

1. Tier 15.

D. Cover Text.

1. Power.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fill unused punched-out openings in boxes with closures.

B. Use outlet boxes sized to accommodate quantity of conductors enclosed.

C. Provide pull boxes or junction boxes in conduit runs where indicated or as required to facilitate pulling of wires or making of connections.

1. Make box covers accessible.

D. Identify circuit numbers on inside of box and cover plate.

1. Identification shall be post painting of boxes.

E. Identification and Labeling

1. As indicated in Section 26 05 53.

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Identification for Electrical Systems, as indicated, in accordance with provisions of Contract Documents.

B. Provide the following:

1. Identification for raceways.
2. Identification for conductors.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

C. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. American National Standards Institute (ANSI):
   a. ANSI A13.1 Standard for the Identification of Pipes.
   b. ANSI Z535.4 Safety Labels.
2. ASTM International (ASTM):
   a. ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
3. NFPA 70 National Electrical Code.
4. Occupational Safety and Health Administration (OSHA):
   a. 29 CFR 1910.144 Safety Color Code for Marking Physical Hazards.
   b. 29 CFR 1910.145 Specifications for Accident Prevention Signs and Tags.
5. UL 969 Compliance Guidelines for Marking and Labeling Systems.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer literature for each electrical identification product indicated.

B. Project Information:

1. Identification Schedule:
   a. Index of all electrical equipment and system components on project of identification signs and labels. Include appropriate colors of both lettering and label background.

1.4 COORDINATION

A. Identification required in this section applies to equipment furnished in other Divisions.

B. Coordinate identification names and abbreviations with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, operation manuals, maintenance manuals, code requirements, standards, and 29 CFR 1910.145.

1. Use consistent designations throughout Project.
2. Equipment identification shall be same as designation indicated on plans.

C. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

D. Coordinate installation of identifying devices with location of access panels and doors.

E. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer of materials meeting required standards.

2.2 MATERIALS

A. Power and Control Raceway Identification Materials:

1. Colors for Raceways Carrying Circuits at 600 V or Less:
    a. Legend: Indicate voltage and system or service type.

B. Underground-Line Warning Tape:

1. Tape:
    a. Suitable to permanently identify and locate underground electrical and communications utility lines.
    b. Tape and ink:
        1) Chemically inert.
        2) Unaffected when exposed to acids, alkalis, and other destructive substances found in soil.
2. Color and Printing:
    a. Comply with applicable referenced standards.
    b. Inscriptions for Red-Colored Tapes with Black Lettering: ELECTRIC LINE, HIGH VOLTAGE.
3. Construction:
    a. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
    b. Non-detectable tape:
        1) Thickness: 4 mils 0.1 mm.
        2) Weight: 18.5 pound/1000 SQ FT. 9.0 kg/100 sq. m.
        3) Width: 3 inches 75 mm.

C. Warning Labels and Signs:

1. Comply with applicable referenced standards.
2. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
3. Warning label and sign shall include, but are not limited to, the following legends:
    a. Arc Flash Warning: “WARNING – ARC FLASH HAZARD.”
    b. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

D. Equipment Identification Labels:

1. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting.
    a. Colors as indicated in Identification Schedule below.
    b. Letters:
        1) 7 mm 1/4 inches high for equipment with cover plate less than 305 mm 12 inches wide.
        2) 13 mm 1/2 inches high for equipment with cover plate over 305 mm 12 inches wide:

E. Miscellaneous Identification Products:

1. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

F. Floor Marking Tape:

1. 2 inches 50 mm wide, 5-mil 0.125 mm pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

1. Coordinate all signage with Owner's facility-wide standard nomenclature, if applicable.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches 300 mm below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches 400 mm overall.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label applied in bands. Install labels at 30 feet 10 M maximum intervals.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, manholes, and handholes, use color-coding conductor tape to identify the phase.

C. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Install underground-line warning tape for both direct-buried conduit as well as conduits in ductbank.

D. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated.

E. Nameplates: Provide engraved laminated nameplates for electrical equipment.

1. Panelboard nameplates:
    a. Center nameplate near top of each section (including sections of multi-section panels). Label text to include:
        1) Equipment name and branch, e.g., "Panel XXXX - Normal Branch".
        2) Source, e.g., "Source - Switchboard XXXX", or "Source – Panel XXXX via Transformer XXXX" as appropriate.
2. Transformers:
    a. Center nameplate near top of face plate or cover. Label text to include:
        1) Equipment name and branch, e.g., "Transformer XXXX - Normal Branch".
        2) Description of load, e.g., "Load – Panelboard XXXX".

3) Source, e.g., "Source – Busduct XXXX".

F. Flash Hazard Warning Signs:

1. Provide for switchboards, panelboards, and motor control centers per NEC Article 110.

G. Device Plates:

1. Stainless Steel.

H. Boxes & Enclosures:

1. Identify circuit numbers on inside of box and cover plate.

END OF SECTION

SECTION 26 09 23
LINE VOLTAGE LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Lighting Control Devices, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 REFERENCES

A. Referenced Standards:

1. Underwriter's Laboratories (UL):
   a. UL 20 Standard for Safety for General-Use Snap Switches.
   b. UL 514D Cover Plates for Flush-Mounted Wiring Devices.
2. National Electric Manufacturers Association (NEMA):
   a. WD-1 General Color Requirements for Wiring Devices.
   b. WD-6 Wiring Devices - Dimensional Requirements.
3. US Federal Specifications:
   a. Federal Specification switches (WS-896E).
   b. Federal Specification device plates (W-P-455).

1.3 SUBMITTALS

A. Product Data:

1. Technical data on each type of device.
2. Manufacturer’s wiring and installation information.

B. Shop Drawings:

1. Occupancy sensor layout.
   a. Submit a lighting plan clearly marked by manufacturer showing occupancy sensor type, location and proper orientation.
   b. Submit any applicable interconnection diagrams.

C. Contract Closeout Information:

1. Warranty.

1.4 WARRANTY

A. Minimum five year warranty for occupancy sensors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Standard Toggle Switches:

1. Base:
   a. Hubbell.
2. Optional:
   a. Cooper.
   b. Leviton.
   c. Pass & Seymour / Legrand.

B. Line Voltage Occupancy Sensors:

1. Base:
   a. WattStopper.
2. Optional:
   a. Eaton Greengate.
   b. Hubbell.
   c. Leviton.
   d. Lutron.
   e. Sensor Switch

C. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Toggle Switches:

1. Toggle switches shall be of the same manufacturer providing receptacles.
   a. See Section 26 27 26.
2. Lighting switches:
   a. Specification grade, quiet-operating toggle-type with back and side wiring, 120-277 volts, AC only, 20 amp rated unless otherwise indicated.
      1) Listed per UL 20 and certified by UL to Federal Specification W-S-896E and visibly marked "Fed Spec W-S-896 inches".
      2) Equip with a green grounding terminal.
3. Refer to Symbol Legend for types.
4. Refer to table at end of Section 26 05 53 for device colors of switches and wall plates.
5. Toggle-type switch:
   a. Single-pole: Hubbell HBL1221.
   b. Three-way: Hubbell HBL1223.

B. Occupancy Sensors:

1. Refer to Symbol Legend for types.
2. All sensors shall be manufactured by same company and shall be aesthetically compatible with similar models from the same product line or generation of products.
3. Low Voltage Dual Technology 360-degree Ceiling Sensor:
   a. Capable of detecting presence in control area by detecting Doppler shifts in transmitted ultrasound and passive infrared heat changes.
   b. Ultrasonic sensing shall be volumetric in coverage with frequency of 40 KHz. It shall automatically adjust the detection threshold dynamically to compensate for changing levels of activity and airflow throughout controlled space and shall provide volumetric coverage without gaps in coverage within controlled areas.
   c. Temperature compensated PIR with dual element sensor and multi-element Fresnel lens.
   d. Coordinate between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting ON.
   e. Retrigger feature in which detection by either technology shall retrigger the lighting system ON within 5 seconds of being switched OFF.
   f. Ceiling mounted with a flat, unobtrusive appearance and provide 360-degree coverage.
   g. Sensor shall operate at 24 VDC/VAC and utilize a power pack.
   h. The lens shall cover up to 1000 square feet of walking motion.
   i. Time delay feature that is adjustable from 5 to 30 minutes, set by DIP switch.

j. Include walk-through mode, where lights turn OFF 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

k. Built-in light level sensor that works from 10 to 300 foot-candles.

l. Parallel wiring capability to allow for coverage of large areas.

m. Additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options.

n. Each sensing technology shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled.

o. Time delay shall be set at 15 minutes and high PIR sensitivity with relay in Automatic ON mode.

p. WattStopper model no. DT-300.

4. Power Pack:

a. Power pack shall be a self-contained transformer and relay module measuring 1-3/4 by 2-3/4 by 1-3/4 inches. Power pack shall have primary dual-voltage inputs of 120/277 VAC.

b. Power pack shall have dry contacts capable of switching 20 amp ballast and incandescent load at 120 VAC, 60 Hz, 1 hp at 120-250 VAC, 60 Hz; 20 amp ballast at 277 VAC, 60 Hz.

c. Power pack shall provide a 24 VDC, 225 mA output.

d. Power packs shall be capable of parallel wiring without regard to AC phases on primary.

e. Power pack can be used as a stand-alone, low voltage switch, or can be wired to sensor for auto control.

f. Power pack shall have hold-ON and hold-OFF inputs for integration with lighting control panels, BMS and other building systems.

g. Power pack shall have overcurrent protection if the low voltage current drawn exceeds 225 mA. In the event of an overcurrent, the low voltage output current shuts down and the LED will blink to indicate a fault condition.

h. Power pack shall be UL 2043 plenum rated and shall have low voltage teflon coated leads, rated for 300 volts.

i. WattStopper model no. BZ-50.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate devices as indicated and as scheduled in Section 26 00 10.

B. Center devices with regard to paneling, furring and trim.

C. Set devices plumb or horizontal and extending to finished surface of wall, ceiling or floor as case may be without projecting beyond same.

D. Route neutral conductor and grounding wire to every junction box containing a line voltage switch.

E. Occupancy Sensors:

1. Verify sensor type, quantity, location, aiming and sensitivity with manufacturer's recommendations.

a. Set time delays and sensitivities of devices, if applicable, per specifications and as appropriate to usage of room.

2. Test controlled spaces to insure 90- to 100 percent coverage of controlled space.

a. If test fails, adjust sensitivity, re-aim, relocate, and/or add sensors.

3. Exact locations of control unit hardware boxes shall be based on observing good installation practices. Installation shall conform to manufacturer's written installation recommendations.
4. Control unit hardware shall be installed in a manner which minimizes aesthetic impact of hardware on appearance of affected rooms. Control unit hardware shall be completely contained within a suitable NEMA enclosure, with no exposed wiring other than low-voltage Class 2 wiring.
5. Size and install system raceways as indicated and in accordance with manufacturer's requirements for installation of system's wiring. Tag conductors at junction and terminal points.
6. Mount sensors so they will not receive light directly from a light source or reflecting surface.
7. Provide masking inserts on infrared sensors as required to prevent inadvertent turn-on through doorways.
8. Where bi-level switching or manual on/off switching is indicated, provide sensors and/or power packs suitable for low voltage manual switching or provide line voltage series switching as required.
9. For bi-level occupancy sensors, set the first relay for auto-on/ auto-off and the second relay for manual-on/auto-off operation.
10. Provide training to familiarize Owner’s personnel with operation and proper adjustment of occupancy sensing devices and systems.

3.2 CLEANING

A. Remove paint spatters and other spots, dirt and debris from equipment.

B. Clean equipment and devices internally and externally using methods and materials recommended by manufacturer.

C. Correct improperly located devices.

END OF SECTION

SECTION 26 22 13
LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Low Voltage Distribution Transformers, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Provide transformers conforming to following standards:

1. NEMA ST20 Dry Type Transformers for General Applications
2. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
3. ANSI/IEEE C57.12.91 Standard Test Code for Dry-Type Distribution and Power Transformers
4. DOE 10 CFR Part 431 (DOE 2016) Energy Efficiency Program for Certain Commercial and Industrial Equipment
5. UL 1561 Standard for Dry-Type General Purpose and Power Transformers

1.3 SUBMITTALS

A. Product Data:

1. Technical data on each type of transformer.
2. No-load core loss and full-load coil loss data.
3. Percent impedance and X/R ratio data.
4. Load efficiency curve plots for each type of transformer.
5. Absolute Peak Inrush (rms) amps.
6. Practical Max Inrush (rms) amps.
7. All transformers must be clearly identified in submittal by name, i.e., “NT1A”.

B. Contract Closeout Information:

1. Operation and Maintenance Data.
   a. See Section 01 78 23.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dry-type Transformers:

1. Base:
   a. Schneider Electric/Square D.
   b. Eaton.
   c. General Electric.
   d. Siemens.

B. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Insulating materials are to exceed NEMA ST20 standards and be rated for 220 degrees C UL component recognized insulation system.

B. Three phase transformers 15kVA and larger shall be 150 degrees C temperature rise above 40 degrees C ambient.

C. Transformers shall be supplied with quality, full width electrostatic shields resulting in a maximum effective coupling capacitance between primary and secondary of 33 picofarads. With transformers connected under normal loaded operating conditions, attenuation of line noise and transients shall meet or exceed following limits:

1. Common Mode:
   a. 0 to 1.5kHZ: 120dB.
   b. 1.5kHZ to 10kHZ: 90dB.
   c. 10kHZ to 100kHZ: 65dB
   d. 100kHZ to 1MHZ: 40dB.
2. Transverse Mode:
   a. 1.5kHZ to 10kHZ: 52dB.
   b. 10kHZ to 100kHZ: 30dB.
   c. 100kHZ to 1MHZ: 30dB.

D. Maximum temperature of top of enclosure shall not exceed 50 degrees C rise above a 40 degrees C ambient.

E. Transformer efficiencies shall be in accordance with DOE 10 CFR Part 431 defined levels effective January 1, 2016. Older in-stock transformers are unacceptable. Efficiency values shall be determined in accordance with DOE 10 CFR Part 431.

Single Phase		**Three Phase**	
kVA	Efficiency percent	kVA	Efficiency percent
15	97.70	15	97.89
25	98.00	30	98.23
37.5	98.20	45	98.40
50	98.30	75	98.60
75	98.50	112.5	98.74
100	98.60	150	98.83
167	98.70	225	98.94
250	98.80	300	99.02
333	98.90	500	99.14

2.3 CONSTRUCTION

A. Transformer coils (except buck/boost type) shall be dual winding of continuous wound construction and shall be impregnated with non-hygroscopic, thermosetting varnish.

B. Cores to be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below saturation point to prevent core overheating.

C. Completed core and coil shall be bolted to base of enclosure but isolated by means of rubber vibration-absorbing mounts.

D. Provide aluminum or copper windings.

E. There shall be no metal-to-metal contact between core and coil and enclosure except for a flexible safety ground strap.

F. Sound isolation systems requiring complete removal of all fastening devices will not be acceptable.

G. Core of transformer shall be visibly grounded to enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.

H. Transformer enclosures shall be ventilated (30 kva and above) and fabricated of heavy gauge, sheet steel construction.

I. Provide finish suitable for outdoor applications as applicable.

J. Provide weather shields for outdoor units.

K. Sound levels shall be warranted by manufacturer not to exceed following:

1. 15 to 50KVA: 45dB
2. 51 to 150kVA: 50dB
3. 151 to 300kVA: 55dB.
4. 301 to 500kVA: 60dB.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations and instructions.

B. Provide minimum of 2 inches clearance on both sides and rear of all ventilated transformers or greater when required by manufacturer.

C. External wiring connections: See Section 26 05 33.

D. Provide wall mounting brackets and/or trapeze mounting supports and bracing as indicated or as required.

E. Floor-mounted transformers shall be mounted on concrete pads per Section 26 00 10.

F. Provide labeling per Section 26 05 53.

END OF SECTION

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SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Panelboards, as indicated, in accordance with provisions of Contract Documents.

B. Provide distribution panelboards and lighting and appliance panelboards as specified and indicated on schedules and drawings.

C. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. System Standards:

1. NEMA PB-1 – Panelboards.
2. NEMA PB-1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards rated 600 volt or less.
3. NEMA KS 1 – Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
4. UL 50 – Enclosures for Electrical Equipment.
5. UL 67 – Panelboards.
6. CSA Standard C22.2 No. 29-15– Panelboards and Enclosed Panelboards.
7. Federal Specification W-P-115C – Type I Class 1.
8. Federal Specification W-P-115C – Type II Class 1.

1.3 SUBMITTALS

A. Shop Drawings:

1. Identify panelboards by alphanumeric designation with branch circuit breaker sizes and types indicated in panelboard schedules or one-line-diagram.
2. Shop drawings and product data shall be submitted along with, or subsequent to, a complete short circuit analysis and coordination study per Section 26 28 00. Product data or shop drawings submitted prior to power system studies will be rejected.
3. Coordination drawings showing final layout of equipment in all electrical rooms with actual panelboards submitted.

B. Product Data:

1. Technical data on each type of panelboard.

C. Contract Closeout Information:

1. Operating and maintenance data.

1.4 DEFINITIONS

A. Lighting and appliance branch circuit: Branch circuit that has a connection to the neutral of the panelboard and that has overcurrent protection of 30 amperes or less in one or more conductors.

B. Lighting and appliance branch-circuit panel boards: Panelboard having more than 10% of its overcurrent devices protecting lighting and appliance branch circuits.

C. Power Panelboard: Panelboard having 10% or fewer of its overcurrent devices protecting lighting and appliance branch circuits. The terms “power panelboard” and “distribution panelboard” will be used interchangeably.

D. Load Center: Panelboard used in residential or light commercial applications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Panelboards:

1. Base:
    a. Eaton.
    b. ABB/General Electric.
    c. Schneider Electric/Square D.
    d. Siemens.

2.2 MATERIALS

A. Panelboards:

1. Dead front type.
2. Provide with non-insulated equipment grounding terminal strip located in top or bottom gutter including main grounding lug and individual terminals for at least 50% of panel circuits including spare circuits and space provisions; increase gutter space accordingly for grounding strip.
3. Provide lighting panelboards with branch circuit connection to main bus arranged for sequence phasing.
4. Equip bus bars for panelboard with main lugs, main fused switch or main circuit breaker, capacity as required or indicated.
5. Panelboard bussing to be tin-plated aluminum.
6. Provide special features such as split bus, lighting contactors, extra-width gutters as required.
7. Provide panelboard busses fully rated for specified interrupting rating. Series rating of panelboards and overcurrent protective devices is not acceptable.
8. Provide full length bussing including areas indicated as space only.

B. Circuit Breaker Panelboards:

1. Provide bolted-on circuit breaker type (or breakers equipped with an integral mounting bracket). Plug-in circuit breakers not acceptable.
2. Provide main busses and back panels which permit changing of circuit breakers without additional machining, drilling or tapping.
3. All multi-pole breakers provide single handle with common trip.
4. Include provisions for locking specific circuit breakers in the “ON” position where indicated.
5. Provide shunt trip mechanism on breakers where indicated.
6. Provide ground fault protection as indicated coordinated with upstream devices.
7. Design so a combination of one, two and three pole circuit breaker can readily be assembled in the same panelboard.
8. Circuit breakers operable in horizontal or vertical position and removable from front of panelboard without disturbing adjacent units.
9. Tandem or half-size circuit breakers not allowed.
10. Panelboard ratings:
    a. In 120/208 V panelboards: Minimum 10,000 AIC symmetrical, as indicated on drawings, or as required by power systems studies, whichever is greatest.
    b. In 277/480 V panelboards: Minimum 14,000 AIC symmetrical, as indicated on drawings, or as required by power systems studies, whichever is greatest.

C. Load Centers:

1. Plug-in circuit breaker type.
2. Provide with non-insulated equipment grounding terminal strip including main grounding lug or lugs as required and individual terminals for at least 50% of panel circuits including spare circuits; increase gutter space accordingly for grounding strip.
3. Provide load centers with main circuit breaker, capacity as indicated.
4. All multi-pole breakers of single handle and common trip.
5. Tandem or half-size circuit breakers not allowed.
6. Provide gutter tap kits for load center risers as required.
7. Dead-front type equipped with branch circuit breakers for each branch circuit.
8. Design so combination of one and two pole circuit breakers can be readily assembled in same panel.
9. Eaton "BR" series or approved equal. Riser load centers shall be provided with gutter tap kits. Provide tap kits as required for specified riser feeder.
10. In 120/208 V panelboards: Minimum 10,000 AIC symmetrical, as indicated on drawings, or as required by power systems studies, whichever is greatest.

D. Cabinets:

1. Galvanized sheet steel, code thickness.
2. Lighting and appliance panel boards 5-3/4 inches 145 mm deep by 20 inches 508 mm wide minimum.
3. Standard door and trim with lock on inner door.
4. Fasten trim to cabinet by means of adjustable clamps.
5. Equip door with chrome-plated combination lock and catch; supply two milled keys with each lock; key locks alike.
6. Provide directory frame on inside of door.
7. Identify all circuit locations in each respective panel with load and location served.
    a. Directory shall be typed.
    b. Typed directory database (Microsoft Excel file, Microsoft Word file, or equivalent) to be given to Owner to incorporate future circuit changes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations and instructions.

B. Panelboard Cabinet Supports:

1. Gypsum Wall Board walls:
    a. Attach to studs via unistrut cross members or metal backing bolted or welded to studs where not otherwise shown.
2. Masonry or concrete walls:
    a. Attach to wall via unistrut cross members.

C. Wall mounted panelboards shall be installed 153mm 6 inches above floor minimum.

D. Provide spare conduits into accessible ceiling space from all flush wall mounted panelboards.

1. Provide one spare 3/4 inches conduit for each 3 spare and/or space branch circuit poles or fraction thereof but no less than two spare 3/4 inches conduits.

3.2 LABELING

A. Provide panelboard labeling as specified in Section 26 05 53.

B. Permanently post, at each panelboard, the conductor color coding scheme used.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Wiring Devices, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Provide wiring devices conforming to the following standards:

1. Underwriter's Laboratories (UL).
    a. UL 498 – Standard for Attachment Plugs and Receptacles.
    b. UL 514D – Cover Plates for Flush-Mounted Wiring Devices.
    c. UL 943 – Standard for Safety for Ground-Fault Circuit-Interrupters.
2. National Electric Manufacturers Association (NEMA).
    a. WD-1 – General Color Requirements for Wiring Devices.
    b. WD-6 – Wiring Devices – Dimensional Requirements.
3. US Federal Specifications.
    a. Fed Spec receptacles (WC-596F).
    b. Fed Spec device plates (W-P-455).

1.3 SUBMITTALS

A. Product Data:

1. Technical data on each type of device.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Wiring Devices:

1. Base:
    a. Hubbell.
2. Optional:
    a. Eaton.
    b. Leviton Manufacturing.
    c. Pass & Seymour (Legrand).
3. All wiring devices shall be provided by the same manufacturer.

B. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Duplex and Single Receptacles:

1. Flush, grounding convenience outlets for side wiring, or side and back wiring.
2. Listed per UL 498 for general use and certified by UL to Fed Spec WC-596F, and shall be visibly marked with the "UL-FS" mark to confirm certification.
    a. Constructed with impact resistant nylon or polyester face and body.
    b. 0.050 inches brass nickel-plated back strap with one piece (non-riveted) ground design.
    c. 0.040 inches brass nickel-plated contacts.

3. Refer to Symbol Legend on Drawings for types.
4. Refer to table at end of Section 26 05 53 for description of device colors.
5. Receptacles:
    a. Specification grade for general use.
    b. 20A, 125V, 2 pole, 3-wire grounding, duplex, specification grade, NEMA 5-20R; Hubbell HBL5362.
    c. 20A, 125V, 2 pole, 3-wire grounding, single, specification grade, NEMA 5-20R; Hubbell HBL5361.
6. Ground Fault Circuit Interrupter (GFCI) type receptacle:
    a. With built-in ground fault interruption, 4 to 6 mA trip sensitivity, 0.025 second trip time, 10,000 A maximum interrupting capacity, self-testing technology, indicator and reset.
    b. 20A, 125V, 3-wire duplex, specification grade, NEMA 5-20R; Hubbell GFRST20.
7. GFI type Weather Resistant GFCI receptacle.
    a. Built-in ground fault interruption, 5-ma sensitivity, indicator, reset, self-test, UV and corrosion resistance.
    b. 15A, 125V, 3-wire duplex: NEMA 5-15R; Hubbell GFWRST15.
    c. 20A, 125V, 3-wire duplex: NEMA 5-20R; Hubbell GFWRST20.

B. Device Plates:
1. Device plates for concealed wiring: Same manufacturer as devices to suit device covered; single, or ganged, in one piece with beveled edges that match faces of plates.
    a. Flush, brushed-finish, type 304 stainless steel.
2. Labeling:
    a. General:
        1) Where labeling of device plates is required, provide clear adhesive labels.
            a) Label inside of device plates with panelboard and circuit number supplying the devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate devices as indicated and as scheduled in Section 26 00 10.

B. Any outlet which is improperly located must be corrected at Contractor's expense.

C. Set outlets plumb or horizontal and flush with face of finished surface of wall, ceiling, or floor.

END OF SECTION

SECTION 26 28 00

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Overcurrent Protective Devices, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 REFERENCES

A. System standards:

1. NEMA AB 1 1993 - (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches
2. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures
3. UL 943 - Standard for Ground Fault Circuit Interrupters
4. CSA C22.2 No. 5.1 - M91 - (Canadian Standard Association) Molded Case Circuit Breakers
5. Federal Specification W-C-375B/GEN - Circuit Breakers, Molded Case; Branch Circuit and Service
6. All power circuit breakers shall be constructed and tested in accordance with ANSI C37.13, C37.16, C37.17, C37.50, UL 1066 and NEMA SG-3 standard.
7. IEEE 141(Red Book) – Recommended Practice for Electric Power Distribution for Industrial Plants.
8. IEEE 399 (Brown Book) – Recommended Practice for Industrial and Commercial Power Systems Analysis.
9. IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations.
10. NFPA 70E – Standard for Electrical Safety Requirements for Employee Workplaces.
11. IEEE 519 – Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

1.3 SUBMITTALS

A. Shop Drawings:

1. Power system study:
    a. Submittal 1:
        1) Prior to or at same time as distribution equipment shop drawings and prior to release of equipment for manufacturer. No distribution equipment shall be released for manufacture until Engineer has reviewed and approved power system study submittal 1. Submittal 1 to include preliminary:
            a) Short circuit study.
    b. Submittal 2:
        1) Field verify conductor lengths after installation. Update power system study with actual installed equipment, conductor lengths and any changes in conductor sizes. Submit updated study at least 3 months prior to applying final settings for testing and 6 months prior to substantial completion of project. Include any recommended changes in Submittal 2. Submittal 2 to include final:
            a) Short circuit study.
            b) Arc flash study.
    c. Performed by independent, third party firm or by manufacturer of electrical distribution equipment. Study to be stamped and signed by registered professional engineer.

Submit credentials of individuals performing study and background of firm for approval prior to start of work. Minimum of five years' experience in high and low voltage power system analysis is required for individual in charge of producing study.

d. Provide computer generated system one-line diagram clearly identifying individual equipment buses, bus numbers, device numbers and maximum available short-circuit current at each bus.

e. Use specified conductor sizes and estimated conductor lengths for shop drawing.

f. Short circuit study:

1) Provide calculation methods and assumptions, base per unit quantities selected, one-line diagrams, source impedance data including utility company system characteristics, typical calculations, tabulations of calculation quantities and results, conclusions and recommendations.

2) Notify Engineer in writing of equipment not properly rated for fault conditions. Identify any prohibited operating/switching scenarios that would over-duty certain identified equipment.

g. Arc flash study:

1) Provide arc flash study in conjunction with short circuit and protective device coordination study.

2) Include all electrical distribution equipment in study including but not limited to:

a) Distribution and branch circuit panel boards.

3) Arc flash boundary distances and incident energy at each device shall be determined by worst case incident energy at that device resulting from maximum and minimum available fault current at main distribution switchgear or switchboard for each valid system operating/switching mode under all probable source conditions. For low voltage equipment (600 volt and below), incident energy calculations shall be made at 100 percent and 85 percent arcing current per IEEE 1584.

4) Provide tabulation of data for each bus analyzed.

B. Product Data:

1. Technical data on each type of device including:

a. Outline drawings with dimensions.

b. Ratings for voltage, amperage and maximum interrupting ratings.

c. Trip unit functions and adjustments

d. Accessories.

e. Wiring diagrams.

f. Manufacturer shall provide hard copy time/current characteristic trip curves (and Ip and I^2t let through curves for current limiting circuit breakers) for each type of circuit breaker.

2. Submit with associated switchgear, switchboard, panelboard or other assembly.

C. Contract Closeout Information:

1. Operation and Maintenance Data.

a. Include instructions for circuit breaker mounting, trip unit functions and adjustments, trouble shooting, accessories and wiring diagrams.

2. Final power system study based on actual installed equipment, field measured conductor lengths and any applicable modifications to contract documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Overcurrent Protective Devices.

1. Base:

a. Eaton.
b. General Electric
c. Schneider Electric/Square D.
d. Siemens.

B. Equipment and devices by same manufacturer.

2.2 MATERIALS

A. Circuit Breakers:

1. Provide circuit breakers as required by other specifications and drawings. Provide special features as indicated including but not limited to:
   a. Drawout construction.
   b. Electrical operation.
   c. Key interlock for main-tie-main arrangements.
   d. Ground fault protection.
2. Provide lugs rated for 75 degree C wire minimum.
3. Contractor shall review one line diagrams and confirm that circuit breakers have adequate lugs to accommodate size and quantity of conductors indicated on one line diagrams, panel and motor control schedules.
4. Lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors.
5. Circuit breakers shall be capable of accepting bus connections.
6. Overcurrent devices shall be fully rated for available fault current unless otherwise specifically indicated.
7. Frame sizes 1000 and greater shall include ground fault protection.
8. Molded case type
   a. Constructed of glass reinforced insulating material. Current carrying components shall be completely isolated from handle and accessory mounting area.
   b. Provide over center, trip free, toggle operating mechanism which shall provide quick-make, quick-break contact action. Provide common tripping of two and three pole circuit breakers.
   c. Circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.
   d. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
   e. Provide each circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit breaker tripping mechanism for maintenance and testing purposes.
   f. Provide factory seal with date code on face of circuit breaker.
   g. Provide circuit breakers equipped with UL Listed electrical accessories as noted on associated schedule or drawing.
   h. Provide circuit breaker handle accessories with provisions for locking handle in ON and OFF position as noted on associated schedule or drawing.
   i. Provide circuit breakers UL Listed for reverse connection without restrictive line and load markings and suitable for mounting in any position.
   j. Provide circuit breakers UL Listed to accept field installable/removable mechanical type or compression type lugs. Provide lug body bolted in place; snap in design not acceptable.
   k. Thermal-Magnetic Circuit Breakers:

1) Used only as follows unless otherwise indicated:
    a) Main, feeder and branch circuit breakers in lighting and appliance panelboards as defined in Section 26 24 16.
    b) Main, feeder and branch circuit breakers rated 125 amps and less in distribution panel boards as defined in Section 26 24 16.
    c) Motor circuit protectors.
2) Provide permanent trip unit containing individual thermal and magnetic trip elements in each pole.
3) Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductors in a 40 deg C ambient temperature.
4) Provide circuit breaker frame sizes above 150 amperes with magnetic trip adjustment located on front of circuit breaker.
5) Provide UL Listed HACR type for two- and three-pole circuit breakers rated up to 250 amperes at 600 VAC.
6) Provide Class A (5 ma) sensitivity breaker where GFCI circuit breakers are indicated.

2.3 POWER SYSTEM STUDY

A. Use SKM-PTW to provide computer generated power system study of specified electrical power distribution system in accordance with IEEE 141 and 399.

1. Include electrical distribution system from main distribution equipment (including utility and generator sources) down to each 208 volt branch circuit panelboard. Study shall include each valid system operating/switching mode under all probable source conditions.
2. Data collection:
    a. Provide required data for preparation of studies. Performer of studies shall furnish contractor with listing of required data immediately after award of contract.
    b. Expedite collection of data to assure completion of studies as required for final approval of equipment shop drawings.
    c. Input data shall include power company’s short circuit contribution as calculated and verified by them.
    d. Verify characteristics of utility service overcurrent devices with power company.

B. Analysis shall include:

1. Short circuit study:
    a. Scenarios that result in maximum fault conditions shall be adequately covered in study. For example, if closed transition transfer switches are provided or if utility is paralleled with standby generators at any time, combined contribution from utility and generators shall be considered.
    b. Include complete fault calculations as specified herein for each proposed and ultimate source combination. Note that source combinations may include present and future supply circuits, large motors and/or generators.
    c. Calculate 1/2 cycle (or 5 cycle where appropriate for MV equipment) short circuit interrupting and momentary (asymmetrical ‘close and latch’) duties, when applicable for an assumed 3-phase bolted fault at each load interrupter switchgear, transformer primary and secondary terminals, low-voltage switchgear, switchboard, distribution panelboards, bus duct, automatic transfer switch, motor control center, 480 volt panelboard, 208 volt panelboard and other significant locations throughout system.
    d. Include equipment/device ratings, X to R ratios and symmetrical fault currents in tabulations. Where actual (calculated) X/R ratio exceeds device test X/R ratio, appropriate fault duty adjustment shall be made in accordance with ANSI/IEEE standards and included in tabulations.

e. Base transformer impedance on lowest tolerance limit allowed by ANSI C57.12 (7.5 percent below listed value). Use actual nameplate impedance when available.

2. Arc flash study:
   a. Perform arc flash analysis in accordance with NFPA 70E with calculations performed in accordance with IEEE 1584A.
   b. Provide following data for each bus analyzed.
      1) Flash Bus Name.
      2) Protective Device Name.
      3) Bus Operating Fault Current.
      4) Protective Device Bolted Fault Current.
      5) Protective Device Arcing Fault Current.
      6) Trip/Delay Time (SEC).
      7) Breaker Opening Time (SEC).
      8) Ground.
      9) Equipment Type.
      10) Gap (MM).
      11) ARC Flash Boundary (IN).
      12) Working Distance (IN) consistent with Owner's arc flash policy.
      13) Incident Energy (CAL/cm^2)
      14) Required Protective FR Clothing (PPE) Category.
   c. Provide following data on each arc flash hazard warning label:
      1) Flash Hazard Protection Boundary.
      2) Incident Energy Level.
      3) Required Personal Protective Equipment Category with brief description.
      4) Shock hazard when cover is removed.
      5) Limited Approach Boundary.
      6) Restricted Approach Boundary.
      7) Prohibited Approach Boundary.
      8) Include date of calculation, utility short circuit capacity and voltage as of that date.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide overcurrent protective devices in switchboards, panelboards and motor control centers as indicated in those sections.

B. Field Settings:

1. Perform field adjustments of protective devices as required to place equipment in final operating condition. Settings shall be in accordance with approved power system study.
2. Provide certified calibration report for each protective device.

C. Arc Flash Labels:

1. Arc flash hazard warning label on each piece of electrical equipment.

D. Arc Flash Boundaries:

1. Identify arc flash protection boundaries in front of all electrical panel boards,. Provide outline of arc flash protection boundaries with 2 inches wide strip of red/white Seton M6356 OSHA warning tape or equivalent.

END OF SECTION

SECTION 26 43 13
SURGE PROTECTIVE DEVICES (SPD)

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Surge Suppression Devices, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 DESCRIPTION

A. This specification includes surge protective devices that clamps transient voltage, diverts surge current and attenuates high-frequency electrical line noise.

B. Surge protective devices shall be located at service entrance equipment and at downstream switchgear, switchboards, motor control centers, busway, distribution panelboards and/or branch circuit panelboards where indicated on Drawings or Panelboard Schedules.

C. Surge protective devices shall be internally mounted within the protected equipment enclosure.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Engaged in design and manufacturer of specified system for a minimum of five (5) years
2. SPD manufacturer shall be same as manufacturer of protected equipment.

B. Design, manufacture, test, and install SPD equipment in compliance with latest edition of following standards:

1. American National Standards Institute and Institute of Electrical and Electronic Engineers:
   a. ANSI/IEEE-C62.41.1 Guide on the Surge Environment in Low Voltage AC Power Circuits.
   b. ANSI/IEEE-C62.41.2 Recommended Practice on Characterization of Surges in Low Voltage AC Power Circuits.
   c. ANSI/IEEE-C62.45 Recommended Practice on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits.
2. American National Standards Institute and Underwriters Laboratories:
   a. ANSI/UL-50 Enclosures for Electrical Equipment.
   b. ANSI/UL-67 Panelboards.
   c. ANSI/UL-845 Motor Control Centers.
   d. ANSI/UL-857 Busway.
   e. ANSI/UL-891 Dead Front Switchboards.
   f. ANSI/UL-1283 Electromagnetic Interference Filters.
   g. ANSI/UL 1449 Fourth Edition, Surge Protective Devices.
   h. ANSI/UL 1558 Metal Enclosed Low Voltage Power Circuit Breaker Switchgear.
3. National Fire Protection Association:
   a. NFPA-70 National Electrical Code.
   b. NFPA-780 Lightning Protection Systems.
4. Military Standards
   a. MIL STD 220C Method of Insertion Loss Measurement.
5. Underwriters Laboratories:
   a. UL 96A Lightning Protection Systems.

C. Internally mounted SPD equipment shall be UL-1449 and UL-1283 Listed or shall be UL-1449 and UL-1283 component recognized as a surge protective device and electromagnetic interference filter. The protected equipment including the SPD shall be fully tested and certified to the applicable switchgear, switchboard, motor control center, busway and/or panelboard UL Standard.

1.4 SUBMITTALS

A. Shop Drawings:

1. Submit unit dimensions, weights, mounting provisions, connection details and layout diagrams of each SPD application.
2. Indicate location with respect to protected bus and connection characteristics to bus including material type, length and routing.

B. Product Data:

1. Copy of UL 1449 Certification under Category VZCA or VZCA2 with applicable model numbers highlighted and indicating following information:
   a. Model number.
   b. Product Type.
   c. Voltage.
   d. Phase.
   e. Voltage protection rating per mode.
   f. Nominal discharge current rating per mode.
   g. Maximum continuous operating voltage rating per mode.
2. Standard catalog data sheets indicating:
   a. Modes of protection.
   b. Surge current capacity per mode.
   c. Surge current capacity per phase.
   d. Short circuit current rating.
   e. Filter attenuation.
   f. Diagnostics and monitoring features.

C. Contract Closeout Information:

1. Operation and Maintenance Data.
   a. See Section 01 78 23.
2. Warranty.

1.5 WARRANTY

A. Manufacturer’s Limited Ten-Year Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Surge Suppression Devices:

1. Base:
   a. Eaton/Cutler-Hammer – SPD Series.
2. Optional:
   a. Square D/Surgelogic – IMA/EMA Series
   b. Siemens Energy & Automation/Sentron – TPS3 Series.
   c. General Electric – TR7000 Series.

3. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Environmental Requirements:

1. Operating temperature range shall be minus 40 degrees F to plus 122 degrees F minus 40 degrees C to plus 50 degrees C.
2. Relative humidity range shall be 5% to 95% non-condensing.
3. Capable of operation at altitudes up to 16,000 feet 5,000 M above sea level.
4. No audible noise.
5. No appreciable emissions of EMI/RFI fields.

B. General Electrical Requirements:

1. SPD shall be a combination of a solid state, parallel connected surge suppression device and an electromagnetic interference filter.
2. The surge suppression elements shall be Metal Oxide Varistor (MOV).
3. Each MOV shall be provided with individual over-current and thermal over-temperature protection.
4. Surge current shall be equally distributed to all components to ensure equal stressing and maximum performance.
5. Nominal operating voltage: as indicated on the drawings or panelboard schedules.
6. Nominal operating frequency: 60 Hz.
7. Protection modes: provide directly connected suppression elements between line and neutral (L-N), line and ground (L-G), and neutral and ground (N-G).
8. Maximum Continuous Over Voltage (MCOV) shall equal or exceed the following:
   a. 208Y/120 volt systems:
      1) L-N: 150.
      2) L-G: 150.
      3) N-G: 150.
      4) L-L: 300.
   b. 480Y/277 volt systems:
      1) L-N: 320.
      2) L-G: 320.
      3) N-G: 320.
      4) L-L: 640.
9. Voltage Protection Rating (VPR) shall not exceed the following:
   a. 208Y/120 volt systems:
      1) L-N: 800.
      2) L-G: 800.
      3) N-G: 800.
      4) L-L: 1200.
   b. 480Y/277 volt systems:
      1) L-N: 1200.
      2) L-G: 1200.
      3) N-G: 1200.
      4) L-L: 2000.
10. Nominal discharge current rating: 20kA.
11. Short circuit current rating (SCCR): 200kA.

12. EMI/RFI filter shall provide minimum 50 dB noise attenuation at 100 kHz using MIL-STD-220A insertion loss test method.
13. Diagnostics and monitoring:
    a. Solid state monitoring of each mode and power loss in any phase.
    b. Externally visible green/red LED operational status indicator lights for each protection mode. Absence of a green light and presence of red light shall indicate which mode(s) or phase(s) have been damaged.
    c. Audible alarm with silence switch shall sound if any fault condition occurs.
    d. Form C dry contacts (1 NO/1 NC) for remote status monitoring. Contacts shall change state if any fault condition occurs.
    e. Test switch shall test SPD's diagnostics and monitoring system.

C. Specific Electrical Requirements by Application/Location:

1. Internally mounted within service entrance equipment:
    a. UL Labeled as Type 2, or Type 4 investigated by UL for use in Type 2 applications.
    b. Tested and suitable for use in ANSI/IEEE C62.41 Category C environments.
    c. Surge current capacity:
        1) Maximum surge current rating per phase shall be minimum 250kA.
        2) Maximum surge current rating per mode shall be minimum 125kA.
    d. Factory installed.
        1) SPD equipment shall be located within the service entrance equipment enclosure and installed in the factory by the service entrance equipment manufacturer.
        2) SPD equipment shall be connected directly to the protected equipment bus on the load side of the service disconnect. If direct bus connection is not possible, conductor leads may be provided. Conductor leads shall be kept as short and straight as possible. Leads shall be minimum #8 conductors and twisted with a minimum of three twists per foot (ten twists per meter) in the conductors to minimize impedance. Tie wrap twisted conductors at 4 inches 100 mm spacing.
        3) Provide a remote diagnostics panel mounted on the cover of the service entrance equipment enclosure and visible from outside the enclosure.

D. Factory-test SPD equipment prior to shipment, including but not be limited to:

1. Quality assurance checks.
2. MCOV and let-through voltage verification tests.
    a. MCOV testing shall consist of units burned-in at applicable MCOV for a minimum of one hour.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install SPD equipment per manufacturer's recommendations.

B. Do not energize SPD's until distribution system has been energized, stabilized and tested.

C. Disconnect SPD's during distribution system insulation resistance testing.

END OF SECTION

SECTION 26 51 13
BUILDING LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Building Lighting, as indicated, in accordance with provisions of Contract Documents.

B. Section includes interior luminaires and building mounted exterior luminaires, including luminaire accessories, lamps, LED modules, power supplies, and drivers.

C. Completely coordinate with work of other trades.

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C62.41.2 IEEE Recommended Practice on Characterization of Surges in Low Voltage (1000 V and less) AC Power Circuits.
2. ANSI C78.377: Specifications for the Chromaticity of Solid State Lighting Products.
3. ANSI C82.77: Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment.

B. Federal Communications Commission (FCC):

1. Code of Federal Regulations (CFR), Title 47, Part 18, Industrial, Scientific, and Medical Equipment.
2. Code of Federal Regulations (CFR), Title 47, Part 15 Class B: Radio Frequency Devices, Commercial Rated.

C. International Electrotechnical Commission (IEC):

1. IEC 61000-3-2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
2. IEC 61347-1: General and Safety Requirements for Lamp Control Gear.
3. IEC 61347-2-13: Particular Requirements for DC or AC. Supplied Electronic Control gear for LED Modules.
4. IEC 61547: Equipment for general lighting purposes - EMC Immunity Requirements.
5. IEC 62384: DC or AC Supplied Electronic Control Gear for LED Modules - Performance Requirements.

D. Institute of Electrical and Electronic Engineers (IEEE):

1. IEEE C62.41-91: Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits.
2. IEEE 1789: Recommended Practice for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers.

E. Illuminating Engineering Society of North America (IESNA):

1. IES LM-28: Approved Method: Guide for the Selection, Care and Use of Electrical Instruments in the Photometric Laboratory.
2. IES LM-37: Approved Method: Guide for Determination of Average Luminance (Calculated) for Indoor Luminaires
3. ANSI/IES LM-48: Testing Calibration of Locking Type Photoelectric Control Devices
4. ANSI/IES LM-58: Approved Method: Spectroradiometric Measurement Methods for Light Sources.

5. ANSI/IES LM-63: ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information.
6. ANSI/IES LM-72: Approved Method: Directional Positioning of Photometric Data.
7. ANSI/IES LM-75: Approved Method: Goniophotometer Types and Photometric Coordinates.
8. ANSI/IES LM-77: Approved Method: Intensity Distribution Measurement of Luminaires and Lamps Using Digital Screen Imaging Photometry.
9. ANSI/IES LM-78: Approved Method: Total Luminous Flux Measurement of Lamps using an Integrating Sphere Photometer.
10. ANSI/IES LM-79: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.
11. ANSI/IES LM-80: Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.
12. ANSI/IES LM-82: Approved Method: Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
13. ANSI/IES LM-84: Approved Method: Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines and Luminaires.
14. ANSI/IES LM-85: Approved Method: Electrical and Photometric Measurements of High-Powered LEDs.
15. ANSI/IES LM-88: Approved Method: Optical and Electrical Measurements of AC-LED Packages and Arrays or Modules.
16. ANSI/IES LM-90: Approved Method: Measuring Luminous Flux Waveforms for Use in Temporal Light Artifact (TLA) Calculations.
17. ANSI/IES TM-15: Luminaire Classification System for Outdoor Luminaires.
18. ANSI/IES TM-21: Technical Memorandum: Projecting Long Term Lumen Maintenance of LED Light Sources.
19. ANSI/IES TM-25: Technical Memorandum: Ray File Format for the Description of the Emission Properties of Light Sources.
20. ANSI/IES TM-26: Technical Memorandum: Projecting Catastrophic Failure Rate of LED Packages.
21. ANSI/IES TM-27: Technical Memorandum: Standard Format for the Electronic Transfer of Spectral Data.
22. ANSI/IES TM-28: Technical Memorandum: Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaires.
23. ANSI/IES TM-30: IES Method for Evaluating Light Source Color Rendition.
24. ANSI/IES TM-31: Technical Memorandum: Measurement Uncertainty for Lighting Equipment Calibration Using Integrating Spheres.
25. ANSI/IES TM-33: Standard File Format for the Electronic Transfer of Luminaire Optical Data.
26. ANSI/IES TM-35: Technical Memorandum: Projecting Long-Term Chromaticity Coordinate Shift of LED Packages, Arrays, and Modules.
27. ANSI/IES TM-38: Technical Memorandum: Photometric and Electrical Measurements of Tunable-White Solid-State Lighting Products.
28. ANSI/IES LS-2: Lighting Science: Concepts and Language of Lighting.
29. ANSI/IES RP-27: Recommended Practice: Photobiological Safety for Lighting Systems.

F. National Electrical Manufacturer's Association (NEMA):

1. NEMA SSL1: Electronic Drivers for LED Devices, Arrays, or Systems.
2. NEMA SSL3: High-Power White LED Binning for General Illumination.
3. NEMA SSL7A: Phase Cut Dimming for Solid State Lighting: Basic Compatibility.
4. NEMA 410: Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.

G. National Fire Protection Association (NFPA):

1. NFPA 70: National Electrical Code (NEC)
2. NFPA 101: Life Safety Code.

H. UL International (UL):

1. UL 1310 Standard for Class 2 Power Units.
2. UL 8750 Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.3 SUBMITTALS

A. Shop Drawings:

1. For continuous pattern luminaires, indicate layout, individual section lengths, and LED/driver module quantities.
   a. Show details of connections, emergency driver and module placement, corners and extensions, end plates, and mounting. Include pendant or bracket locations and show remote transformers/power supplies/drivers.
   b. Provide field-measured overall dimensions in wall-to-wall and wall-to-corner applications.
2. Details of luminaire flange, special construction, accessories, and finishes.

B. Product Data:

1. Identify luminaires by Lighting Equipment Schedule designation.
   a. For each luminaire, provide cut sheets indicating following information:
      1) Name of manufacturer, model, and complete catalog number.
         a) Include product data details for catalog number references to explain special construction, accessory or finish, and photometric data.
      2) Photometric Data:
         a) Collected by an independent testing laboratory.
         b) Indicate optical performance developed using methods of Illuminating Engineering Society of North America (IESNA) as follows:
            (1) Candlepower data presented graphically and numerically, in maximum 10 degree increments.
            (2) Develop data for up and down quadrants that are normal, parallel, and at 45 degrees to lamp if light output is asymmetric.
            (3) Zonal lumens stated numerically in 10 degree increments as above.
            (4) Fixture efficiency.
2. Solid state Luminaires:
   a. LED Luminaires:
      1) Total input wattage.
      2) Luminaire voltage.
      3) Delivered lumens.
      4) Color temperature.
      5) Color rendering index (CRI),color fidelity (Rf), color gamut (Rg), and where requested, individual R-values measured in accordance with ANSI/IESNA TM 30 standards.
      6) Rated life, measured in accordance with IESNA standards.
      7) Total harmonic distortion (THD).
      8) Submit in tabular format the characteristics of submitted fixture per the technical information categories of the Lighting Equipment Schedule. Deviations from specified criteria shall be identified by a plus or minus percentage.

9) Submit the rated lumen maintenance life of LED luminaires. Life shall be reported based upon the light source's L70 rating in accordance with IESNA standards.

b. LED Drivers:

1) Driver manufacturer and model number.
2) Driver rated life.
3) Driver dimensions.
4) Driver type (0-10V, constant voltage, constant current).
5) If applicable, include lumen management protocols.
6) Dimming range and control device compatibility list.
7) Wiring Diagrams – as needed for special operation or interaction with other systems.

3. Coordinate ballasts/drivers used with lamping/LED modules, lamp sockets, and control devices prior to submitting Shop Drawings.
4. For product substitutions, provide calculations performed in AGI32 in specific spaces as identified by Lighting Designer where product is used.
5. Coordinate luminaires with ceiling construction.
   a. Confirm clearances and fixture flange compatibility with construction.

C. Project Information:

1. Manufacturer's installation instructions.
2. Warranties.

D. Contract Closeout Information:

1. Inventory of driver/module replacement stocks.
2. At time of Substantial Completion as defined by the Architect, submit all installation and maintenance tools received from various luminaire vendors clearly and permanently tagged with Manufacturer's name and relevant luminaire type(s) to the Owner's Representative.
3. Maintenance and Operating Manuals.
   a. See Section 01 78 23.

E. Review of shop drawings and product data does not waive the Contractor of their obligations.

1.4 QUALITY ASSURANCE

A. Advise Architect of discrepancies between luminaire catalog references shown or specified and actual ceiling construction, prior to submission of shop drawings.

1. Failure to do so will require correction at no additional cost.

B. Coordinate ballasts/drivers used with lamping/LED modules, lamp sockets, and control devices prior to submitting shop drawings.

C. Each luminaire shall be listed with nationally recognized testing laboratory including but not limited to, UL, CSA, ETL, under UL 1598 and UL 8750, or an equivalent standard from recognized testing laboratory, and manufactured in accordance with NEC.

D. Materials and installations shall be in accordance with latest revision of National Electrical Code and any applicable Federal, State, and local codes and regulations.

E. Luminaires shall comply with relevant and current ANSI, CBM, ESTA, FCC, IEC, IEEE, IESNA, NEMA, NFPA, and UL standards and practices.

1.5 WARRANTIES

A. Manufacturer's Warranty shall be from date of Substantial Completion.

1. Include labor allowance for full cost of component replacement.
2. Provide warranties, as specified, for the following equipment:

a. Finish.
b. Lenses.
c. Housings.
d. Lamps.
e. Transformers.
f. LED Drivers/Power Supplies.
g. LED Luminaires.

B. Warrant LED drivers for a minimum of five years from Date of Substantial Completion.
1. Include labor allowance for full cost of driver installation.

C. Warrant the luminaire and all of its components to be free from defect in operation or finish for a minimum of five years from the date of Date of Substantial Completion.
1. Warrant LED modules during this period for color and lumen maintenance (percent shift +/- degrees Kelvin).
2. As long as luminaire has been operated within the rated voltage range, Contractor is responsible for cost of materials and labor necessary to repair or replace luminaire.

D. It is the responsibility of the Contractor to manage warranty issues that may arise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Luminaires:
1. Base:
a. As indicated on Lighting Equipment Schedule.
2. Optional:
a. As indicated on Lighting Equipment Schedule.
3. Use catalog numbers listed as a guide only. Follow modifications and other requirements shown or specified.

B. Lamps/LED Modules:
1. GE Lighting.
2. Osram Sylvania.
3. Philips Lighting.
4. Cree.
5. Soraa.
6. Xicato.

C. Power Supply/Drivers:
1. Osram Sylvania.
2. Philips Advance.
3. Mean Well.
4. eldoLED.
5. Hatch.
6. Lutron.

D. Emergency LED Drivers:
1. Philips Bodine.
2. Iota.

E. Other manufacturers desiring approval comply with Section 01 61 00.

2.2 MATERIALS

A. Luminaires:

1. Resistant to corrosion and thermal and mechanical stresses encountered in normal application. Provide accessory equipment such as starters, sockets and lampholders, approved by UL and ETL, unless otherwise noted.
2. Electrical components of recessed luminaires shall be accessible and removable through luminaire without having to remove luminaire from ceiling.
3. Thermally protect luminaire.
4. Housings:
   a. Troffer luminaires: Minimum 22 GA 0.76 mm sheet steel; integral end plates and trim flanges to suit ceiling construction. Provide wire way covers with captive retainers to allow access to electrical components without use of tools.
   b. Downlight luminaires: Minimum 22 GA 0.76 mm sheet steel, or minimum 0.0508 inches 1.29 mm sheet aluminum, unless noted otherwise. Provide auxiliary junction box secured to mounting frame.
   c. Extruded aluminum housings, where scheduled, shall be at least 1/8 inches 3 mm thick.
   d. Punch and form housings prior to finishing (post-paint).
   e. Power Supply/Driver surface shall be in complete contact with housing, having the mounting method designed for efficient conduction of heat.
   f. Fixture shall be properly heat-sinked to assure LED junction temperature ratings are not exceeded. Manufacturer shall provide ambient operating temperature range for which product is warranted.
5. Trim:
   a. For square and rectangular luminaires, miter and continuously weld corners.
   b. Miter perimeter inverted T-Bar angles at corners.
   c. Do not butt or overlap squared ends.
   d. Finish joints smooth.
6. Castings:
   a. Uniform quality, free from imperfections affecting strength and appearance. Exterior surfaces, if not receiving a finish coat, shall be smooth and match adjacent surfaces. At least one coat of clear methacrylate lacquer shall be applied unless a painted finish is specified.
7. Fasteners:
   a. For aluminum or steel luminaires, fastening hardware shall be zinc-nickel plated, stainless steel, or equivalent.
   b. For stainless steel luminaires, fastening hardware shall be stainless steel.
   c. For bronze luminaires, fastening hardware shall be bronze or stainless steel.
8. Finishes: As selected from manufacturer's standards unless scheduled otherwise.
   a. Painted surfaces, except as scheduled otherwise:
      1) Manufacturer's standard metal pretreatment and baked or air-dried, light-stabilized enamel finish: acrylic, alkyd, epoxy, polyester, or polyurethane.
      2) White finishes shall have minimum 85 percent reflectance.
   b. Unpainted aluminum surfaces:
      1) Interior luminaires: Clear anodic coating, satin finish, except as scheduled otherwise.
      2) Exterior luminaires: Clear anodic coating.
9. Lens/Louver Frames:
   a. Extruded aluminum with mitered corners unless scheduled otherwise.
   b. Hinging or other normal motion shall not cause lens or louver to drop out.

c. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.

10. Lenses:
    a. 100 percent virgin, UV stabilized acrylic.
    b. The lenses shall be held securely in place but must also be removable to clean and service the luminaire.
        1) Luminaires with a spread lens shall also include a lens orientation device to ensure that it is not affected during cleaning or relamping.
    c. There shall be no light leaks between the lens and the luminaire.
    d. Acrylic lenses and diffusers shall be properly cast, molded, or extruded to meet the intent of the specified optics, and shall remain free of any dimensional instability, discoloration, embrittlement, or loss of light transmittance for the period of the Manufacturer's warranty.
11. Reflectors:
    a. High-purity No. 12 aluminum reflector sheet, 0.047 inches 1.45 mm or heavier if specified, free from fabrication or assembly damages. No exposed rivets, springs, or other hardware after installation. Shape reflectors in modified elliptical or parabolic contour to produce no apparent brightness.
    b. Downlights: Any direct image of the light source shall not be visible in 45 degree zone from nadir.
    c. Downlight reflector and baffle finishes: First-quality Alzak anodized specular or semi-specular finish of color as specified, unless otherwise noted in Lighting Fixture Schedule.
        1) Downlight reflectors shall be securely fastened but also removable for cleaning and relamping.
    d. Troffer reflector finish: integral reflectors shall be painted white after fabrication and shall have a minimum reflectance value of 90 percent.
12. Gaskets: Provide gaskets at face plates or frames of recessed luminaires which serve as ceiling trim, and which allow interior access. Provide moisture seal gaskets at exterior locations and in other areas designated. Secure frames to luminaire bodies with screws or other means, to result in tight installation, without light leaks. See Lighting Equipment Schedule for other types of seals and gaskets.
13. Ventilation: Provide ventilation openings of adequate size and quantity to permit operation of lamps/LED modules and power supply/driver without affecting rated output or life expectancy.
14. Lamp Holders:
    a. Position holders so that lamps are in optically correct relation to luminaire components.
    b. LED Module/Array Mountings:
        1) Dedicated quick-connect wiring accessories for field replaceable LED modules and arrays.
        2) LED modules and arrays shall be secured by screws or clips to assure proper connection to heat sink while permitting field replacement.
15. Wiring:
    a. Factory wire luminaire to be compatible with project electrical and controls systems.
    b. Luminaires shall comply with NEC requirements and be supplied with a disconnecting means accessible to qualified persons before servicing or maintaining.
    c. Power supplies and LED modules, unless otherwise specified, shall be field replaceable and shall be serviceable while the fixture is in its normally installed position.
16. Mounting Accessories:

a. Provide appropriate mounting accessories for each luminaire, compatible with various structural conditions encountered. Provide fastening clips (seismic clips) for luminaires supported from framing members of suspended ceilings.

b. Luminaires with adjustable beam angles shall have a locking device to ensure that the beam distribution is not affected during relamping or cleaning.

c. Luminaire Suspension Material:

1) Unfinished spaces: 13 mm 1/2 inches minimum diameter pendant, unless otherwise noted.

2) Finished spaces: Unless otherwise noted, provide manufactured cable or stem and outlet box canopy; contemporary design with swivel self-aligning features; size canopy to cover outlet box; finished to match luminaire. Coordinate pendant location with ceiling tiles/ceiling grid and submit coordinated mounting accessories as part of Product Data submission.

a) Provide luminaires mounted on suspended ceiling grids with outlet box designed for grid mounting with direct cord entry.

d. Mechanical Safety: Unless otherwise specified, retain luminaire closures (lens doors, trim frame, hinged housings, etc.) in secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

e. LED luminaires shall be manufactured specifically for their respective light source with dedicated electrical connections and with power supplies integral to the fixture, except where remote devices are specified. Assemblies designed to retrofit incandescent luminaires are prohibited except when specifically indicated for use in decorative luminaires designed for LED retrofit lamps.

f. Design luminaires for lamps specified.

g. Fit trims, canopies, and escutcheons snugly and securely to the ceiling and/or wall so that no light leaks occur and so that no gaps or uneven waves are evident.

B. LED Modules:

1. Color temperature measurement shall have a maximum MacAdam Ellipse boundary of 3 SDCM unless otherwise specified in the Lighting Equipment Schedule.

2. LED light output and efficacy shall be measured in accordance with the following standards:

a. IES LM-79

b. IES LM-85

c. IES LM-88

d. IES TM-38

3. LED life and lumen maintenance shall be measured in accordance with the following standards:

a. IES LM-80

b. IES LM-84

c. IES TM-21

d. IES TM-26

e. IES TM-28

f. IES TM-35

4. Rated minimum L70 life of 50,000 hours at 25 deg C.

5. The individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in a light output loss of the entire luminaire.

C. Power Supplies and Drivers:

1. General:

a. Comply with UL and ANSI specifications. Enclosure shall display approval label for compliance with UL standards.

b. Contractor shall verify required voltage, frequency, and power factors.
c. Comply with US Federal Efficiency Laws.
d. Equipment shall not contain PCBs.
e. Manufacturer shall have a ten year history of producing electronic ballasts and/or drivers for the North American market.

2. LED Drivers:
   a. LED Driver types.
      1) 4-Wire (0V to 10V DC Voltage Controlled) Dimming Driver.
      2) 2-Wire Switched Driver.
   b. General.
      1) LED dimming shall be equal in range and light quality to a commercial grade incandescent dimmer.
         a) Free from perceived flicker or visible stroboscopic flicker.
         b) Smooth and continuous change in level (no visible steps in transitions).
         c) Stable when input voltage conditions fluctuate.
         d) Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
      2) Driver shall operate from 60 Hz input source of 120V through 277V with sustained variations of +/- 10 percent (voltage and frequency) with no visible change in light output.
      3) Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.
      4) Driver shall have a Power Factor greater than 0.90.
      5) Driver output shall be regulated to +/- 5 percent across published load range.
      6) Driver shall have a Class A sound rating.
      7) Driver shall have a minimum operating temperature of -20 deg C -4 deg F.
      8) Driver shall tolerate sustained open circuit and short circuit output conditions without fail and auto-resetting without need for external fuses or trip devices.
      9) Driver output ripple current shall be less than 15 percent measured peak-to-average, with ripple frequency greater than 100 Hz.
      10) Driver must limit inrush current and meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 Amps2 – seconds.
      11) Driver shall withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A for Transient protection.
      12) Driver shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
      13) Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements to maintain or deliver improved performance:
         a) Adjustment of forward LED voltage, supporting 3V through 55V.
         b) Adjustment of LED current from 200 mA to 1.05A at the 100 percent control input point in increments of 1 mA.
         c) Adjustment for operating hours in lumen-maintenance drivers to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the luminaire and deliver up to 20 percent energy savings early in the life cycle.
      14) Driver: UL Recognized under the component program and shall be modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
      15) Drivers shall have a rated life greater than or equal to 150,000 hours.

16) LED engine must be compatible with type of driver and perform within the dimming range specified in the Lighting Equipment Schedule. Coordinate prior to submission of shop drawings.

17) If driver is remote-mounted, provide maximum allowable distances for secondary wire runs to luminaires. Driver shall be housed in NEMA enclosures so rated for the power supply and located in code-compliant, sound-isolated, well-ventilated, easily accessible areas. Size wire according to run length and LED Manufacturer's size and distance-of-run requirements and in accordance with code requirements.

18) LED power supplies shall be suitably sized to accommodate the LED array consistent with industry standards, including IEC standard 60929 Annex E.

19) Driver shall be available in an all metal-can construction for optimal thermal performance.

20) Driver shall be provided with integral color-coded connectors.

21) Provide with mounting hardware as required.

c. Light Quality.

1) Over the entire range of available drive currents, driver shall provide step-free, continuous dimming. Driver shall respond similarly when raising.

a) The luminaire shall be capable of continuous dimming over a range of 100 percent to 10 percent of rated lumen output unless otherwise noted on Lighting Equipment Schedule.

(1) Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.

2) Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels.

3) Drivers to track evenly across multiple fixtures at all light levels and shall have an input signal to output light level that allows smooth adjustment over the entire dimming range.

4) Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index. At all points within the dimming range from 100 to 0.1 percent, luminaire shall have:

a) LED dimming driver shall provide continuous step-free, flicker-free dimming similar to incandescent source.

b) Flicker index shall be less than 5 percent at all frequencies below 800 Hz.

d. Control Input.

1) 4-Wire (0V to 10V DC Voltage Controlled) Dimming Drivers.

a) Must meet IEC 60929 Annex E for General White Lighting LED drivers.

b) Connect to devices compatible with 0V to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each control output based on voltage drop and control capacity.

c) Must meet ESTA E1.3 for RGBW LED drivers.

d) Driver shall utilize fully isolated 0V to 10V control inputs. Input shall be protected from line voltage miswire and shall be immune and output-unresponsive to induced AC voltage on the control leads.

D. Emergency Battery Wall Pack Luminaires:

1. Transfer Circuit:

a. Automatically energize lamps upon failure of normal lighting circuit in area; de-energize lamps and activate high-rate charge upon restoration of normal source.

2. Battery Charger:

a. Automatic two-rate or acceptable solid-state pulse type capable of replacing maximum charge taken out in 1-1/2 hour emergency discharge period within 12 hours; manual two-rate charger will not be accepted.

3. Provide visual signal to indicate state of charge.
4. Provide integrally mounted, adjustable emergency lights and status lights.
5. Provide luminaire with self-diagnostics and self-testing.
6. Where shown or specified provide remote sealed beam adjustable lights.
7. Provide white UV stabilized thermoplastic housing in finished areas.
8. Manufacturers:
    a. Dual-Lite.
    b. EmergiLite.
    c. Lithonia.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate lighting control devices with fixture power supplies and drivers. Advise Architect of discrepancies prior to submission of shop drawings. Failure to do so will result in correction at no additional cost to Owner.

3.2 INSTALLATION

A. Strictly follow the manufacturer's directions for installation and assembly of lighting equipment. Luminaire installation shall include suitable lamps and required equipment, materials, parts, attachments, devices, hardware, cables, supports, frames, and brackets necessary for complete and fully operating installation.

B. Locate luminaires in accordance with architectural reflected ceiling plans.

1. Where field conflicts exist, coordinate relocation of equipment with Lighting Designer.

C. Mount luminaires at heights indicated in Section 26 00 10 and as indicated on drawings. Where field conflicts exist, or mounting height is not stated, coordinate with Lighting Designer.

D. Verify structural support to ensure luminaires are supported to maintain level and alignment.

E. Support luminaires weighing more than 55 pounds directly from structure with approved hangers.

F. Ground luminaires per NEC Article 410.

G. Provide exit sign at exit locations, with mounting type, number of single or double faces, and directional arrows as required for exiting.

1. Where exit signs are pendant mounted, provide manufacturers pendant mount stem kit.
2. Provide proper structural support for junction box and exit sign.

H. Align horizontally positioned fluorescent lamps or LED circuit boards of luminaires within a single room in same direction unless indicated otherwise. Align the luminaires so that the horizontal bar or element within the luminaire is parallel to the long axis of the space unless otherwise noted. Orientation of luminaires within similar spaces shall remain consistent.

I. Seal luminaires for wet locations (i.e. knock-outs, pipe and wire entrances) to prevent water wicking.

J. Luminaire finishes which are disturbed in any way during construction shall be touched up or refinished in a manner satisfactory to the Architect and which does not void warranty.

K. Install reflector cones, louvers, baffles, lenses, trims, and other decorative elements after completion of ceiling tile installation, plastering, painting and general cleanup.

L. Surface-Mounted and Pendant-Hung Luminaires:

1. Attach surface-mounted lighting luminaires to ceiling system with positive clamping devices that completely surround supporting members.

a. Attach safety wires between clamping device and adjacent ceiling hanger or to structure above.
b. Do not exceed design carrying capacity of supporting member for luminaire load.
c. Additional seismic requirements:
1) For installations located in seismic design categories C, D, E or F, provide the following supplementary supports:
a) Support pendant-hung lighting luminaires directly from structure above, using 9 GA steel wire, without relying on ceiling suspension system for support.

2. Pierce ceiling material for hangers and outlet boxes as required.
3. Do not remove ceiling material above surface-mounted luminaires.
4. Hang luminaires plumb with continuous rows in alignment.
5. Unless otherwise noted, suspend luminaires in each room or area at same height regardless of varying clear height conditions.
a. Provide stem lengths as required.
b. The canopy portion of a pendant-hung luminaire installed in a finished space with an exposed-to-structure ceiling shall be installed directly to the bottom of the structural deck unless otherwise noted on the plans. Extending Unistrut, all-thread or similar means from the exposed deck down to a lower mounting height in order to suspend the box/canopy is not acceptable. Notify Engineer immediately if on-site conditions will result in a mounting conflict.
6. Cord of pendant-hung fixtures must enter directly into approved wiring box without passing through plenum, in accordance with NEC.
7. Provide suspended luminaires with flexible cord.
a. Flexible cord shall connect to a junction box located directly above luminaire feed point.
b. Flexible metal conduit and luminaire whips are not allowed for suspended luminaires.
c. Trim cords to length and attach to suspension cable at regular intervals.
d. Do not coil flexible connections.
8. Surface or pendant luminaires mounted end-to-end shall have flat end caps to assure flush alignment and shall be UL listed for through wiring.
9. In exposed ceiling areas, install drivers and auxiliary equipment non-integral to luminaire in accessible, permanently installed NEMA-rated metal cabinets or housings. Field paint exposed cabinets or housings to match adjacent surfaces.
10. Provide pendant-hung cylinder luminaires with swivel hangers which allow luminaire to swing in any direction but not permit stem to rotate.
11. In mechanical, electrical and storage spaces, pendant-mounted luminaires, not in continuous rows, shall be supported by conduit or metal channel, similar to Unistrut, and All Thread.
a. Pendant-mounted luminaires in continuous rows shall be fastened to each other or mounted on continuous metal channel.
b. Provide alignment clips on linear luminaires mounted in continuous rows.
12. Contractor shall provide and/or coordinate additional bracing in wall or above ceiling as required to support fixture in accordance with manufacturer’s recommendations.

M. Emergency Battery Wall Pack Fixtures:

1. Connect conduit directly to units; do not use plug-in connection.
2. Mount lights on each unit, number as shown.
a. Mount each remote light on an outlet box cover plate, and splice wiring in box.
b. Feed remote lights from batteries with wire sized in accordance with manufacturer’s recommendations for voltage drop and ampacity.
c. Aim at night, with no stray light from other sources, to maximize light along egress route.

3. Test and verify operation prior to Owner occupancy.

3.3 COMMISSIONING

A. Coordinate lighting operations, including support from Luminaire and Controls Manufacturers, with commissioning and controls.

B. Synchronize fully functional lighting and lighting controls systems to address lighting operation in complete and code compliant manner.

C. Provide documentation related to commissioning, including record drawings identifying luminaire control loops and addresses with respect to specific luminaire types and Initial Preset Schedule Spreadsheet.

3.4 ADJUSTABLE FIXTURES

A. Aiming shall occur upon Substantial Completion of project including, but not limited to, installation of artwork, millwork, furniture, and plantings.

B. Aim adjustable fixtures as directed. Make final adjustments in presence of Lighting Designer.

C. Perform this work at night, outside of normal working hours, with no light from stray sources.

D. Use light meter to obtain as even a distribution as possible.

E. Aiming shall occur upon substantial completion of project including, but not limited to, installation of artwork, millwork, furniture, and plantings.

F. Coordinate a time with Architect and Owner, to make final adjustments to aiming.

G. Provide ladders, scaffolding, lifts, and tools required for accessing and aiming fixtures, and coordinate this activity based on site availability of Lighting Designer.

3.5 ADJUSTING, RELAMPING AND CLEANING

A. Perform final focusing of adjustable luminaires in presence of Owner's Representative, including times outside regular working hours. Furnish ladders scaffolding and rigging, as required, for focusing and adjustment of luminaires.

B. Replace inoperable luminaires prior to final acceptance.

C. Replace LED modules and LED arrays if any individual module is not properly functioning.

D. Replace noisy and malfunctioning luminaires prior to final acceptance.

E. Replace luminaires, drivers, or control devices where necessary to eliminate strobing and flicker.

F. Align luminaires and remove paint splatters, dirt, and debris.

G. Touch up any visible damages to luminaire finish.

H. Wipe clean luminaire reflectors, lenses, and housings after installation.

I. Install luminaires with caution to avoid fingerprints or smudges on surfaces of louvers and downlight reflectors.

1. Use cleaning materials and methods that will not damage finish.
2. Where fingerprints or smudges cannot be adequately removed, replace affected luminaire.

3.6 SPECIAL PROTECTION

A. Remove protective covers immediately prior to date of Substantial Completion.

3.7 FIELD MODIFICATIONS STOCK

A. To facilitate the addition of extra exit signs due to unforeseen deficiencies in satisfying life safety egress requirements, provide the following:

1. 5 percent of each exit sign type.

3.8 REPLACEMENT STOCK

A. Warranty replacements are not to be taken from replacement stock.

END OF SECTION

DIVISION 31

EARTHWORK

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SECTION 31 23 00

BUILDING EXCAVATION, FILLING, AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Building Excavation, Filling, and Backfilling, as indicated, in accordance with provisions of Contract Documents.

B. Definitions:

1. Unsuitable material:
    a. Debris and/or soil material judged unsuitable by Geotech for support of slabs and foundations or for use as a fill or backfill material.
2. Maximum density:
    a. As determined using ASTM D698, Standard Proctor.
3. Geotech:
    a. Geotechnical Engineer or Representative of Foundation Consultant employed by Owner to inspect foundation work.
4. Rock excavation:
    a. Excavation of rock material which is sufficiently solid and of such strength that it cannot be loosened or broken down in a single pass with following equipment:
        1) Late model tractor mounted hydraulic ripper equipped with a single digging point sized for use with and propelled by a crawler type tractor rated at a minimum 200 net flywheel horsepower, operating in low gear.
        2) A 0.6 cubic meter 3/4 CU YD hydraulic backhoe with a rock tooth.

C. Completely coordinate with work of other trades.

1.2 EXTRA WORK

A. Removal and replacement of unsuitable material will be paid as extra work.

1. Notify (Owner's agent) in time to estimate and record quantity removed.
2. If Contractor is unwilling to accept estimate, notify Architect or Construction Manager prior to backfilling and a surveyor will be hired at Contractor's expense to measure and determine excavated volumes.
3. Recorded quantity will be basis for payment.
4. Include unit price on Bid Form.

B. Rock excavation will be paid for as extra work.

1. Notify (Owner's agent) in time to estimate and record quantity removed.
2. Recorded quantity will be basis for payment.
3. Include unit price on Bid Form.

1.3 QUALITY ASSURANCE

A. Subsurface Soils Investigations:

1. Soils information was obtained at project site for use in preparing foundation design.
2. Availability of soils report information is indicated in specifications.
3. Examine site and soils report and independently determine character of materials to be encountered.

B. Inspection and Compaction Density Tests:

1. Owner will hire the Geotech to inspect earthwork and to conduct in-place compaction moisture-density tests.
2. Initial test at each location will be paid by Owner.
3. If initial test fails, Contractor pays for retesting.

C. Subgrade Tolerance:

1. 30 mm 0.10 feet plus/minus from required elevations.

1.4 SUBMITTALS

A. Product Data:

1. Maximum Density curves for fill and backfill material.
2. Sieve analysis for granular fill.

1.5 JOB CONDITIONS

A. Determine safe slopes of excavations for the earth materials encountered.

B. Shoring and bracing excavations as required to protect personnel, utilities, existing construction and new work.

C. Removing bracing when safe.

D. Protecting from damage (or replacing as directed) sidewalks, pavements and other facilities resulting from settlement, lateral movement, undermining erosion or other hazards created by earthwork operations.

E. Complying with rules and regulations governing earthwork and respective utilities.

F. Providing adequate barricades and warning lights as required to protect persons and property and to satisfy applicable regulations.

G. Maintaining bench marks, movements and other reference points and replacing any disturbed or destroyed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill and backfill material:

1. Clean selected materials, approved by Geotech, from site excavation or from off-site borrow areas.
2. Submit Maximum Density curves for each source of fill or backfill material.

B. Granular fill:

1. Clean, densely graded granular material with a balanced fine content.
2. Compactable, east-to-trim, granular fill that will remain stable and support construction traffic.
3. DOT approved road base.
4. Submit sieve analysis verifying following gradation.
    a. 100% passing 1 1/2 inches sieve.
    b. 15 to 55% passing the No. 4 sieve
    c. Less than 12% pass the No. 200 sieve that is clean granular fill with less than 3% clay or friable particles.

PART 3 - EXECUTION

3.1 EXCAVATION - GENERAL

A. Do not perform blasting.

B. Excavate to dimensions and elevations indicated regardless of materials encountered.

1. Allow additional space as required for construction operations and inspection of foundations.

C. Remove old foundations, building construction, and other materials concealed beneath present grade, as required to execute work, and as indicated.

D. Remove and replace unsuitable material with compacted backfill as directed by Geotech.

E. If rock is encountered, remove and replace with suitable material as directed by Geotech.

F. Properly level off bottoms of excavations.

G. Where cuts are required to bring floor slabs to proper elevations, excavate to level below slabs allowing for required granular fill.

1. Remove rocks, lumps, vegetation and other foreign material.
2. Scarify top 205 mm 8 inches of earth below granular fill and recompact to 95% of maximum density.
3. Where compacted subgrade is disturbed by frost, moisture, or construction operations, re-scarify and recompact as directed by Geotech.

H. Control grading around building.

1. Pitch surface to prevent water from running into excavated areas or damaging structure.
2. Maintain pits and trenches where footings will be placed free of water.
3. Provide pumping required to keep excavated spaces clear of water during construction.
4. When springs or running water are encountered, notify Architect. Provide free discharge of water by trenches or pumps, and drain to appropriate point of disposal as directed.

3.2 FOOTINGS AND PILE CAPS

A. Provide undisturbed, level, dry, unfrozen surfaces free of foreign or loose material for placement of footings and pile caps.

B. Obtain Geotech's approval of footing subgrade before placing concrete.

C. Do not carry excavations lower than indicated, except when directed by Geotech.

D. If excavations are made below indicated level, fill with concrete of same strength as foundation concrete at no extra cost.

E. When excavations become soft and wet, remove soft material and replace with concrete of same strength as foundation concrete, at no extra cost.

F. When freezing temperatures are expected, do not excavate to full depth unless footings or pile caps can be placed immediately. Protect bottoms of excavations from freezing if placement is delayed.

3.3 BUILDING SUBGRADE PREPARATION, FILLING, AND BACKFILLING

A. Remove rocks, lumps, frozen ground, soft or wet material, vegetation, and other foreign material upon which fill or backfill is to be placed.

B. Before scarifying subgrade, obtain approval of Geotech.

C. Scarify top 205 mm 8 inches of excavation surface or subgrade and compact to 95% of maximum density.

D. Place fill material in 150 mm 6 inches lifts and compact each lift to 95% maximum density.

E. Maintain moisture between 0 and 3% above optimum moisture content during compaction.

F. Compact fill and backfill using suitable mechanical tamping equipment to obtain specified density.

1. Use mechanical hand tampers for filling and backfilling next to walls.

2. Compact granular fill using vibratory methods.

G. Where existing ground surface is steeper than one vertical to four horizontal, step surface with steps not exceeding 305 mm 12 inches or slope surface not exceeding one vertical to 50 horizontal.

H. Correct and recompact compacted material not meeting specified compaction requirements. Continue corrective measures until required compaction has been attained.

I. Do not backfill against part of walls, piers, or columns until each part has reached design strength.

1. Do not place fills against walls until floor slabs at top and bottom of walls are in place.
2. Bring backfill up uniformly around building and individual wall units.

J. Do not backfill against foundations, walls, curbs, footings, and areaways until concrete forms have been removed, masonry work has been pointed, and concrete finishing, dampproofing, and waterproofing have been completed.

3.4 GRADING NEXT TO BUILDING

A. To provide drainage evenly slope finished grade away from building walls at slopes not less than one (1) vertical to fifty (50) horizontal.

3.5 GRANULAR FILL UNDER SLABS ON GRADE

A. Place minimum 150 mm 6 inches granular fill below vapor retarder under slabs on grade.

3.6 ACCEPTANCE OF WORK

A. Obtain Architect’s and Geotech’s approval of each earthwork operation before next operation.

B. Notify Architect and Geotech in sufficient time for inspection.

3.7 DISPOSAL OF EXCESS AND WASTE MATERIAL

A. Remove waste and excess materials including excess earth, unsuitable materials, trash and debris and legally dispose of it off Owner’s property.

END OF SECTION