Project Manual for TRANSPORTATION - FUEL TANK REPLACEMENT 12943 South 700 East Draper, Utah 84020

Bid Package



Prepared by:



233 So. Pleasant Grove Blvd., Suite 105 Pleasant Grove, Utah 84062

> CORE Project No. 23-089 March 29, 2024

THESE SPECIFICATIONS ARE COMPLEMENTARY TO THE CONSTRUCTION DRAWINGS AND THE SPECIFICATIONS AND CONSTRUCTION DRAWINGS CONSTITUTE THE CONSTRUCTION DOCUMENTS FOR THE PROJECT

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- 1.1 PROJECT MANUAL PERMIT SET
 - CSD Transportation Fuel Tank Relocation 9300 South 200 East Sandy, Utah 84070
 - B. Owner: Canyon School District 9361 South 300 East Sandy, Utah 84070
 - C. Architect: CORE Architecture Project No. 23-089
 - D. Issued: March 29, 2024
 - E. Copyright 2024. All rights reserved.

END OF DOCUMENT 00 0101

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PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.02 OWNER:

- A. Name: Corner Canyon School District.
 - 1. Address: 9361 South 300 East
 - 2. City: Sandy
 - 3. State: Utah
 - 4. Zip Code: 84070

1.03 CONSULTANTS:

- A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
 - 1. Company Name: CORE Architecture
 - a. Address: 233 S. Pleasant Grove Blvd., Suite 105
 - b. City: Pleasant Grove
 - c. State: Utah
 - d. Zip Code: 84062
 - e. Telephone: (801) 769-3000 Office
 - 2. Primary Contacts:
 - a. Title: Principal
 - b. Name: Curtis Livingston, AIA cell: (801) 787-7921
 - c. Email: curtisl@corearch.com

Title: Project Manager

- b. Name: Kyle Mendoza cell: (801) 367-4839
- c. Email: kylem@corearch.com
- B. Civil Engineering Consultant:
 - 1. Company Name: Meridian Engineering, Inc.
 - a. Address: 1628 W. 11010 S., Suite 102.
 - b. City: South Jordan.
 - c. State: Utah.
 - d. Zip Code: 84095.
 - e. Telephone: (801) 569-1315.
 - 2. Primary Contact: .
 - a. Title: Senior Project Manager.
 - b. Name: Nichole Luthi, PE.
 - c. Email: <u>nluthi@meiamerica.com</u>.
- C. Electrical Engineering Consultant:
 - 1. Company Name: BNA Consulting Engineers
 - a. Address: 4225 Lake Park Blvd., Suite 275
 - b. City: West Valley City
 - c. State: Utah
 - d. Zip Code: 84120
 - e. Telephone: (801) 532-2196 Office
 - 2. Primary Contact:
 - a. Title: Project Manager
 - b. Name: Drayton Bailey cell: (801) 532-2196
 - c. Email: drayton@bnaconsulting.com

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

DOCUMENT 00 2113 - INSTRUCTIONS TO BIDDERS

Instructions to Bidders for the following PROJECT:

Canyon School District Transportation – Fuel Tank Relocation

THE OWNER:

Canyon School District 9361 South 300 East Sandy, Utah 84070

THE ARCHITECT:

CORE Architecture 233 South Pleasant Grove Blvd., Suite 105 Pleasant Grove, Utah 84062

1.1 DEFINITIONS

A. Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consists of the Invitation to Bid, Instructions to Bidders, the Bid Form and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract, Drawings, Specifications and all Addenda issued prior to execution of the Contract.

1.2 BIDDER'S REPRESENTATIONS

- A. The Bidder by making a Bid represents that:
 - 1. The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the work for the bid as submitted.
 - 2. The Bid is made in compliance with the Bidding Documents.
 - 3. The Bidder has visited the site and became familiar with the conditions under which the Work is to be performed.
 - 4. The Bid is based upon materials, equipment and systems required by the Bidding Documents to complete the PROJECT without exception.

1.3 BIDDING DOCUMENTS

- A. The drawings and information in this package include Civil Construction Documents, which include the grading, utilities, paving, curb & gutters. Additional documents include site concrete building or equipment pad/pier requiring construction as part of this bid package (reinforcing schedule will be issued with addendum). The Electrical Plans show locations of light pole bases and construction details.
- B. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner or Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- C. The Bidder shall carefully study and compare the Bidding Documents with each other, and shall examine the site and local conditions and at once report to the Architect errors, inconsistencies or ambiguities discovered.
- D. Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

- E. Interpretations, corrections and changes of the Bidding Documents will be made by Addendum.
- F. Substitutions
 - 1. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
 - No substitution will be considered prior to the receipt of Bids unless written request for approval has been received by the Architect at least seven days prior to the date for receipt of Bids. Refer to 00 2600 "Procurement Substitution Procedures" for additional information.
 - 3. If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.
 - 4. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- G. Addenda
 - 1. Addenda will be transmitted to all invited Prime Bidders.
 - 2. Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for the Bids or one which includes postponement of the date for receipt of Bids.
 - 3. Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.
- 1.4 MODIFICATION OR WITHDRAWAL OF BIDS
 - A. A bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.
 - B. Prior to the time and date designated for receipt of Bids submitted may be modified or withdrawn by notice to the party receiving Bids at the designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder.
 - C. Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.
- 1.5 CONSIDERATION OF BIDS
 - A. Opening of Bids At the discretion of the Owner, the properly identified Bids received on time will be privately opened.
 - B. Rejection of Bids Owner shall have the right to reject any and all Bids. A bid not accompanied by data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.
 - C. Acceptance of Bid (Award) It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive information and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

1.6 POST-BID INFORMATION

A. Contractor's Qualification Statement – Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement. B. Owner's Financial Capacity – The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence id furnished, the Bidder will not be required to execute the Agreement between the Owner and contractor.

1.7 SUBMITTALS

- A. The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:
 - 1. A designation of the Work to be performed with the Bidder's own force;
 - 2. Names of the manufacturers, products, and suppliers of principal items or systems of materials and equipment proposed for the Work; and
 - 3. Names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.
- B. The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.
- C. Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitution person or entity with an adjustment in the Base bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder.
- D. Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

1.8 PERFORMANCE BOND AND PAYMENT BOND

- A. Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.
- B. If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.
- C. If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.
- D. The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered.
- E. Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the mount of the Contract Sum.
- F. The bonds shall be dated on or after the date of the Contract.

- G. The Bidder shall require the attorney-in-fact who executed the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.
- 1.9 BID SECURITY
 - A. **A 5% Bid Security must be attached to bids**. Bid Security may be a bid bond made payable to the order of Canyon School District. The bid security of the accepted bidder shall be forfeited in the case of failure or refusal to enter into a contract and furnish payment and performance bonds as required.
- 1.10 BID RECEIPT
 - A. Bids will be received on or before Friday, April 18, 2024 at 2:00 PM at the offices of Canyon School District

END OF DOCUMENT 00 2113

DOCUMENT 00 2513 - PREBID MEETINGS

1.1 PREBID MEETING

- A. Architect will conduct a Prebid meeting as indicated below:
 - 1. Meeting Date: April 8, 2024.
 - 2. Meeting Time: 2:00pm local time.
 - 3. Location: CSD Transportation Facility.
- B. Attendance:
 - 1. Prime Bidders: Participation at Prebid meeting is mandatory.
 - 2. Subcontractors: Attendance at Prebid meeting is recommended.
 - 3. Notice: Bids will only be accepted from prime bidders in attendance record.
- C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.
 - 1. Last day for questions April 11, 2024 at 5:00pm
- D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:
 - 1. Procurement and Contracting Requirements:
 - a. Invitation to Bid.
 - b. Instructions to Bidders.
 - c. Bidder Qualifications.
 - d. Bonding.
 - e. Insurance.
 - f. Bid Security.
 - g. Bid Form and Attachments.
 - h. Bid Submittal Requirements.
 - i. Bid Submittal Checklist.
 - j. Notice of Award.
 - 2. Communication during Bidding Period:
 - a. Obtaining documents.
 - b. Bidder's Requests for Information.
 - c. Bidder's Substitution Request/Prior Approval Request.
 - d. Addenda.
 - 3. Contracting Requirements:
 - a. Agreement.
 - b. The General Conditions.
 - c. The Supplementary Conditions.
 - d. Other Owner requirements.
 - 4. Construction Documents:
 - a. Scopes of Work.
 - b. Temporary Facilities.
 - c. Use of Site.
 - d. Work Restrictions.
 - Separate Contracts:
 - a. Work by Owner.
 - b. Work of Other Contracts.
 - 6. Schedule:

5.

- a. Project Schedule.
- b. Contract Time.
- c. Liquidated Damages.
- d. Other Bidder Questions.
- 7. Site/facility visit or walkthrough.

- 8. Post-Meeting Addendum.
 - a. Final Addendum issued by April 12, 2024.
- E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.
 - 1. Minutes will include list of meeting attendees.

END OF DOCUMENT 00 2513

General Conditions of the Contract for Construction

for the following PROJECT: (Name and location or address)

THE OWNER: (Name, legal status and address)

THE ARCHITECT: (Name, legal status and address) This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503[™], Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

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The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Subsubcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

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§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203TM-2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203TM-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202TM-2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences.

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

§ 3.3.3 The 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.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

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§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The 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 the Work.

§ 3.7.3 If the 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.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all .1 required taxes, less applicable trade discounts;
- Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and .2 other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.
- § 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The 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.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall eause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certifications, and approval when submitted to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the

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time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

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§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

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The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the 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.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

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Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

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Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

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§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:
- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

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§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

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§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

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§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reasons for Withholding certification and Owner of the Architect's reasons for Payment, and notify the Contractor and Owner of the Architect's reasons for Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

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§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

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

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

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§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not

constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

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§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

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In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Subsubcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

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§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, subsubcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and subsubcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

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§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

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Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Subsubcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- repeatedly refuses or fails to supply enough properly skilled workers or proper materials; .1
- fails to make payment to Subcontractors or suppliers in accordance with the respective agreements .2 between the Contractor and the Subcontractors or Suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- Exclude the Contractor from the site and take possession of all materials, equipment, tools, and .1 construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

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15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

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§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

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§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

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§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

« »

(Name, legal status and principal place of business) << >>< >></

OWNER:

« »« »

« »

« »

(Name, legal status and address) « »« »

BOND AMOUNT: \$ « »

PROJECT:

(Name, location or address, and Project number, if any) «Blank» « »

« »

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.





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(Witness)



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Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business) « »« » « »

« »« » « »

OWNER:

(Name, legal status and address) « »« » « »

CONSTRUCTION CONTRACT

Date: « »	
Amount: \$ « »	
Description:	
(Name and location)	
«Blank»	
«(»)	

BOND

DOND			
Date:			
(Not earlier tha « »	n Construction Contract	Date)	
Amount: \$ « »			
Modifications t	o this Bond: 《》	None	» See Section 16
CONTRACTOR	AS PRINCIPAL	SURETY	
Company:	(Corporate Seal)	Company:	(Corporate Seal)
Signature:		Signature:	
Name and «	»»(())	Name and	<()>(())
Title:		Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone) AGENT or BROKER:





ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.





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§1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- the Owner first provides notice to the Contractor and the Surety that the Owner is considering .1 declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.I shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- the Owner declares a Contractor Default, terminates the Construction Contract and notifies the .2 Surety: and
- the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the .3 Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- After investigation, determine the amount for which it may be liable to the Owner and, as soon as .1 practicable after the amount is determined, make payment to the Owner; or
- Deny liability in whole or in part and notify the Owner, citing the reasons for denial. .2

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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§7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- the responsibilities of the Contractor for correction of defective work and completion of the .1 Construction Contract;
- additional legal, design professional and delay costs resulting from the Contractor's Default, and .2 resulting from the actions or failure to act of the Surety under Section 5; and
- liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual .3 damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirementshall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

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§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

« » (Space is provide CONTRACTOR AS Company:	d below for addit. S PRINCIPAL	ional signatures of aa (Corporate Seal)	lded parties, other tha SURETY Company:	in those appearin	ng on the cover page.) (Corporate Seal)
Signature: Name and Title: Address:	« »« » « »		Signature: Name and Title: Address:	(())(()) (())	
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				· · · · · · · · · · · · · · · · · · ·	

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DRAFT AIA Document G701[™] - 2001

Change Order

PROJECT (Name and address):	CHANGE ORDER NUMBER:	OWNER:
	DATE:	
TO CONTRACTOR (Name and address)	ARCHITECT'S PROJECT NUMBER:	CONTRACTOR:
	CONTRACT DATE:	FIFID:
	CONTRACT FOR:	
THE CONTRACT IS CHANGED AS FOLLOW (Include, where applicable, any undispute	VS: ed amount attributable to previously exect	uted Construction Change Directives)
The original Contract Sum was The net change by previously authorized	Change Orders	
The Contract Sum prior to this Change O	rder was	\$0.00
The Contract Sum will be increased by th	is Change Order in the amount of	
The new Contract Sum including this Cha	ange Order will be	\$
The Contract Time will be increased by Z The date of Substantial Completion as of	Zero (0) days. the date of this Change Order therefore is	and the second
NOTE: This Change Order does not include have been authorized by Construction Ch Contractor, in which case a Change Orde	de changes in the Contract Sum, Contract ange Directive until the cost and time hav r is executed to supersede the Constructio	Time or Guaranteed Maximum Price which re been agreed upon by both the Owner and n Change Directive.
NOT VALID UNTIL SIGNED BY THE AF	CHITECT, CONTRACTOR AND OWNER	R.
ARCHITECT (Firm name)	CONTRACTOR (Firm name)	OWNER (Firm name)
ADDRESS	ADDRESS	ADDRESS
BY (Signature)	BY (Signature)	BY (Signature)
(Typed name)	(Typed name)	(Typed name)
DATE	DATE	DATE

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ATA®
Document
G702型
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1992

Application and Certificate for Payment

American Institute of Architects, All rights reserved. WARNING: This AIA® Document is protected	1971, 1978, 1983 and 1992 by The	AIA Document G702~ - 1992. Copyright © 1953, 1963, 1965,
Owner or Contractor under this Contract.	\$0.00	NET CHANGES by Change Order
named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the	\$0.00 \$0.00	TOTALS
This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor	\$0.00 \$0.00	Total approved this Month
By: Date:	\$0.00 \$0.00	Total changes approved in previous months by Owner
ARCHITECT:	DITIONS DEDUCTIONS	CHANGE ORDER SUMMARY ADI
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)		
AMOUNT CERTIFIED	\$0.00	(Line 3 less Line 6)
		9. BALANCE TO FINISH, INCLUDING RETAINAGE
With the Contract Documents, and the Contractor is clititled to payment of the AMYO'DIVI	\$0.00	8. CURRENT PAYMENT DUE
information and belief the Work has progressed as indicated, the quality of the Work is in accordance		(Line 6 from prior Certificate)
this application, the Architect certifies to the Owner that to the best of the Architect's knowledge,		7. LESS PREVIOUS CERTIFICATES FOR PAYMENT
In accordance with the Contract Documents, based on on-site observations and the data comprising		(Line 4 Less Line 5 Total)
ARCHITECT'S CERTIFICATE FOR PAYMENT	\$0.00	6. TOTAL EARNED LESS RETAINAGE
My Commission expires:	\$0.00	Total Retainage (Lines 5a + 5b or Total in Column I of G703)
Notary Public:	\$0.00	(Column F on G703: <u>\$0.00</u>)=
me this day of		b. 0 % of Stored Material
Subscribed and sworn to before	\$0.00	(Column D + E on G703; (S0.00) =
County of:		a. 0 % of Completed Work
State of:		5. RETAINAGE:
	00.08	4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)
By: Date:	\$0.00	3. CONTRACT SUM TO DATE (Line 1 ± 2)
CONTRACTOR:	\$0.00	2. NET CHANGE BY CHANGE ORDERS
payment shown herein is now due.		1. ORIGINAL CONTRACT SUM
Certificates for Payment were issued and payments received from the Owner, and that current		Continuation Sheet, AIA Document G703, is attached.
Contract Documents, that all amounts have been paid by the Contractor for Work for which previous	th the Contract.	Annlication is made for navment as shown helow in connection w
The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the	NT	CONTRACTOR'S APPLICATION FOR PAYME
CONTRACT DATE: FIELD: F	HITECT:	FROM CONTRACTOR: VIA AR
PERIOD TO: ARCHITECT: CONTRACT FOR: General Construction CONTRACTOR;		
APPLICATION NO: 00J Distribution to: OWNER:	JECT: Blank	TO OWNER: PR

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User Notes: (1665415238)

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APPLICATION DATE: APPLICATION DATE: PERIOD TO: ARCHITECT'S PROJECT NO: G RIALS ENTLY COMPLETED AND STORED TO DATE (G + C)
LICATION NO: LICATION DATE: IOD TO: HITECT'S PROJECT NO: G TOTAL MPLETED AND DRED TO DATE (G + C) (D + E + F) 0.00 0.009
0: % (G + C)

DRAF AIA® Document G703^m - 1992



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DRAFT AIA Document G706A[™] - 1994

Contractor's Affidavit of Release of Liens

PROJEC	T: (Name and address) ER: (Name and address)	ARCHITECT'S PROJE NUMBER: CONTRACT FOR: Gene Construction CONTRACT DATED:	eral	OWNER: ARCHITECT: CONTRACTOR: SURETY: OTHER: OTHER:
STATE C COUNTY The und listed be of mater	OF: OF: ersigned hereby certifies that to t low, the Releases or Waivers of ials and equipment, and all perfo	he best of the undersign Lien attached hereto indurmers of Work, labor o or encumbrances again	ned's knowledge, information clude the Contractor, all Sub r services who have or may l st any property of the Owner	and belief, except as contractors, all suppliers nave liens or arising in any manner
out of th	e performance of the Contract re	ferenced above.	st any property of the Owner	
EXCEPT SUPPO	IONS: RTING DOCUMENTS ATTACI Contractor's Release or Waiver	HED HERETO: of Liens	CONTRACTOR: (Name and	address)
 ว	conditional upon receipt of final	l payment.	BV [.]	
<i>L</i> .	Subcontractors and material and suppliers, to the extent required accompanied by a list thereof.	I equipment by the Owner,	(Signature of representative (Printed name	duthorized
			Subscribed and sworn to be	fore me on this date:
			Notary Public: My Commission Expires:	

RAFT AIA Document G707[™] - 1994

Consent Of Surety to Final Payment

PROJECT: (Name and address)	ARCHITECT'S PROJECT NUMBER:	OWNER:
	CONTRACT FOR: General Construction	ARCHITECT: 🗌
TO OWNER: (Name and address)	CONTRACT DATED:	SURETY:
		OTHER:
In accordance with the provisions of the C	Contract between the Owner and the Contractor as indicated abo	ve, the
(Insert name and address of Surety)		
		, SURETY,
on bond of (Insert name and address of Contractor)	le contra de la cont	
(insert name and date ess of contractor)		and the second
		and the second
1	a Contractor and corose that final payment to the Contractor sh	, CONTRACTOR,
hereby approves of the final payment to the Surety of any of its obligations to (Insert name and address of Owner)	a Contractor, and agrees that final payment to the Contractor of	
		OWNER
as set forth in said Surety's bond.	/	
IN WITNESS WHEREOF, the Surety has	s hereunto set its hand on this date:	
(Insert in writing the month followed by the	he numeric date and year.)	
	(Surety)	
	(Signature of authorized repres	sentative)
Attest		
(Seal):	(Printed name and title)	
		Luuranna ann ann ann ann ann ann ann ann an



Architect's Supplemental Instructions

PROJECT (Name and address):	ARCHITECT'S SUPPLEMENTAL	OWNER:
	INSTRUCTION NO: 001	ARCHITECT: 🔲
		CONSULTANT:
OWNER (Name and address):	DATE OF ISSUANCE:	CONTRACTOR:
	CONTRACT FOR: General Construction	FIELD: 🗌
FROM ARCHITECT (Name and	CONTRACT DATE:	
address): TO CONTRACTOR (Name and address):	ARCHITECT'S PROJECT NUMBER:	
The Work shall be carried out in acco the Contract Documents without chan accordance with these instructions inco or Contract Time.	rdance with the following supplemental instruction age in Contract Sum or Contract Time. Proceeding dicates your acknowledgment that there will be no	ns issued in accordance with with the Work in change in the Contract Sum
DESCRIPTION:		

ATTACHMENTS: (Here insert listing of documents that support description.)

ISSUED BY THE ARCHITECT:

(Signature)

(Printed name and title)



1

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RAFT AIA Document G714[™] - 2007

Construction Change Directive

PROJECT: (Name and address) TO CONTRACTOR: (Name and address)	DIRECTIVE NUMBER: 001 DATE: CONTRACT FOR: General Construction CONTRACT DATED: ARCHITECT'S PROJECT NUMBER:	OWNER: ARCHITECT: CONSULTANT: CONTRACTOR: FIELD: OTHER: OTHER:
You are hereby directed to make the follo (Describe briefly any proposed changes)	owing change(s) in this Contract: or list any attached information in the alte	ernative)
PROPOSED ADJUSTMENTS 1 . The proposed basis of adjustme	nt to the Contract Sum or Guaranteed May	ximum Price is:
\Box • Lump Sum decrease of \$	0.00	-resources were sold and the so
\Box • Unit Price of \$ per		and and a second s
\Box • As provided in Section 7	.3.3 of AIA Document A201-2007	
\Box • As follows:		
2. The Contract Time is proposed	to (remain unchanged). The proposed adju	istment, if any, is 0 days.
When signed by the Owner and Architect and becomes effective IMMEDIATELY as a Con Contractor shall proceed with the change(s) d	d received by the Contractor, this document estruction Change Directive (CCD), and the lescribed above.	Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.
ARCHITECT (Firm name)	OWNER (Firm name)	CONTRACTOR (Firm name)
ADDRESS	ADDRESS	ADDRESS
BY (Signature)	BY (Signature)	BY (Signature)
(Typed name)	(Typed name)	(Typed name)
DATE	DATE	

DOCUMENT 00 3132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. A geotechnical investigation report for Project, prepared by AGEC Applied GeoTech, dated January 24, 2024, is available for viewing as appended to this Document.
 - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. The owner is not responsible for interpretations or conclusions drawn from the data.
 - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF DOCUMENT 00 3132



GEOTECHNICAL INVESTIGATION

TRANSPORTATION FACILITY IMPROVEMENTS

9300 SOUTH 300 EAST

SANDY, UTAH

PREPARED FOR:

CANYONS SCHOOL DISTRICT 9100 SOUTH 500 WEST SANDY, UT 84070

ATTENTION: STEVE MCCLEARY

PROJECT NO. 1230919

JANUARY 24, 2024

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RECOM	IMENDATIONS.A.Site Grading.B.Fuel Tank Foundations.C.Lateral Earth Pressure.D.Seismicity, Faulting and Liquefaction.E.Water Soluble Sulfates.F.Pavement.G.Preconstruction Meeting.TIONS.	Page 6 Page 7 Page 7 Page 10 Page 11 Page 13 Page 13 Page 14 Page 14 Page 14 Page 16 Page 17
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	EXPLORATORY BORING LOCATIONS EXPLORATORY BORING LOGS EXPLORATORY BORING LEGEND AND NOTES CONSOLIDATION TEST RESULTS GRADATION TEST RESULTS SUMMARY OF LABORATORY TEST RESULTS	FIGURE 1 FIGURE 2 FIGURE 3 FIGURE 4 FIGURE 5 TABLE I

EXECUTIVE SUMMARY

- 1. Approximately 4 to 6 inches of asphaltic concrete overlying approximately 7 to 14 inches of base course was encountered in the borings drilled in the existing pavement areas (Borings B-1, B-2, B-5 and B-6) except for Boring B-5 where base course was encountered to a depth of approximately 2½ feet. Fill was encountered below the base course to depths of approximately 2, 3, 4½ and 3½ feet in Borings B-1, B-2, B-5 and B-6, respectively. Topsoil was encountered in the borings drilled in the proposed expansion area (Borings B-3 and B-4) to depths of approximately 8 to 10 inches. Lean clay was encountered below the fill and topsoil. The clay extends to the full depth explored in Boring B-4, approximately 5½ feet. Sand was encountered below the clay in the other borings at depths of approximately 8, 9½, 8½, 5½ and 4½ feet in Borings B-1, B-2, B-3, B-5 and B-6, respectively. The sand extends to the full depth investigated, approximately 20½ feet.
- 2. No subsurface water was encountered in the borings at the time of drilling.
- 3. The proposed above-ground fuel storage tanks may be supported on spread footings bearing on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil and may be designed for an allowable net bearing pressure of 1,500 pounds per square foot. Spread footings supported on at least 2 feet of compacted structural fill may be designed for an allowable net bearing pressure of 3,500 pounds per square foot.
- 4. Unsuitable fill, topsoil, organics and other deleterious materials should be removed from below proposed pavement areas. The upper natural soil and much of the existing fill consist of lean clay or have a high clay content. Access difficulties may be encountered for rubber-tired construction equipment in the pavement expansion area and in existing pavement areas after the pavement has been removed when the upper soil is very moist to wet. Placement of approximately 1 to 2 feet of granular borrow may be needed to provide access for rubber-tired construction equipment when the upper soil is very moist to wet.
- 5. Geotechnical information related to subgrade preparation, pavement, materials and compaction is included in the report.



SCOPE

This report presents the results of a geotechnical investigation for the proposed transportation facility improvements at 9300 South 300 East in Sandy, Utah. The report presents the subsurface conditions encountered, laboratory test results and recommendations for tank foundations and pavement. The study was conducted in general accordance with our proposal dated November 22, 2023.

Field exploration was conducted to obtain information on the subsurface conditions. Samples obtained from the field investigation were tested in the laboratory to determine physical and engineering characteristics of the on-site soil, to define the subsurface conditions at the site for our engineering analysis and to develop recommendations for the proposed foundations and pavement.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

SITE CONDITIONS

The northern portion of the site consists of pavement south of the Canyons School District's transportation building. The southern portion of the site is part of a soccer field.

The pavement is generally asphaltic concrete in fair to poor condition with areas of alligator cracking.

The site is relatively flat with a gentle slope down to the west.


The soccer field is vegetated with grass and was covered with snow at the time of our study.

The surrounding areas include the transportation building to the north as well as additional paved parking and access areas east and west of the building. There is a light rail line to the west. There is a paved access road to the east and Mount Jordan Middle School in the distance to the east. Soccer fields are to the south.

FIELD STUDY

The field study was conducted on January 8, 2024. Six borings were drilled at the approximate locations presented on Figure 1. The borings were drilled with direct push. The borings were logged and soil samples obtained by a geologist from AGEC. Logs of the subsurface conditions encountered in the borings are graphically shown on Figure 2 with legend and notes on Figure 3.

DOUBLE RING INFILTROMETER TEST

A double ring infiltrometer test was conducted in the area of Boring B-3 in sand at a depth of approximately 8½ feet below the ground surface. The infiltration rate measured is approximately 50 inches per hour.

A test pit was excavated with a rubber-tired backhoe to facilitate the testing. The test pit was backfilled without significant compaction. The test pit backfill should be removed and replaced with properly compacted backfill where it would support proposed improvements.



SUBSURFACE CONDITIONS

Approximately 4 to 6 inches of asphaltic concrete overlying approximately 7 to 14 inches of base course was encountered in the borings drilled in the existing pavement areas (Borings B-1, B-2, B-5 and B-6) except for Boring B-5 where base course was encountered to a depth of approximately $2\frac{1}{2}$ feet. Fill was encountered below the base course to depths of approximately 2, 3, $4\frac{1}{2}$ and $3\frac{1}{2}$ feet in Borings B-1, B-2, B-5 and B-6, respectively. Topsoil was encountered in the borings drilled in the proposed expansion area (Borings B-3 and B-4) to depths of approximately 8 to 10 inches. Lean clay was encountered below the fill and topsoil. The clay extends to the full depth explored in Borings B-4, approximately $5\frac{1}{2}$ feet. Sand was encountered below the clay in the other borings at depths of approximately 8, $9\frac{1}{2}$, $8\frac{1}{2}$, $5\frac{1}{2}$ and $4\frac{1}{2}$ feet in Borings B-1, B-2, B-3, B-5 and B-6, respectively. The sand extends to the full depth investigated, approximately 20 $\frac{1}{2}$ feet.

A description of the soil encountered in the borings follows:

<u>Base Course</u> - The base course consists of poorly graded gravel with silt and sand. It is moist and brown.

Laboratory tests performed on a sample of the base course indicate it has a moisture content of 4 percent. A gradation test on the base course indicate it does not meet APWA gradation specifications. Results of the gradation test are presented on Figure 5.

<u>Clayey Fill</u> - The fill encountered below a depth of approximately 2 feet in Boring B-2 and below the base course in Borings B-5 and B-6 consists of sandy lean clay to clayey sand. It is slightly moist to moist and brown to dark brown.

Laboratory tests performed on a sample of the fill indicate it has a moisture content of 11 percent and a dry density of 127 pounds per cubic foot (pcf).



<u>Silty Sand Fill</u> - The fill below the base course in Borings B-1 and B-2 consists of silty sand with gravel. It is moist and light brown.

<u>Topsoil</u> - The topsoil consists of lean clay with sand. It is slightly moist to moist, dark brown and contains roots.

<u>Lean Clay</u> - The clay is medium stiff to very stiff, slightly moist to very moist and brown to grayish brown with iron oxide staining.

Laboratory tests conducted on the clay indicate it has a natural moisture content of 25 percent and natural dry densities ranging from 98 to 102 pcf.

A sample of the clay tested in the laboratory was found to have an unconfined compressive strength of 1,700 pounds per square foot (psf).

A consolidation test conducted on a sample of the clay indicates that it will compress a small to moderate amount with the addition of light to moderate loads. Results of the consolidation test are presented on Figure 4.

<u>Poorly Graded Sand with Silt</u> - The sand contains small to moderate amounts of silt. It is dense to very dense, slightly moist and brown.

Laboratory tests conducted on a sample of the sand indicate it has a natural moisture content of 2 percent and a natural dry density of 109 pcf.

The results of a gradation test conducted on the sand are presented on Figure 5.

Results of the laboratory tests are presented on Table I and on the logs of borings, Figure 2.



SUBSURFACE WATER

No subsurface water was encountered in the borings at the time of drilling.

PROPOSED CONSTRUCTION

We understand that underground fuel storage tanks in the southern portion of the facility will be removed. Pavement in the southern portion of the facility will be reconstructed and expanded to the south. New above-ground fuel storage tanks will be installed. A retention pond is planned in the area of the expanded pavement at the south end of the facility.

We have assumed that the proposed fuel storage tanks will be supported on spread footings. We have assumed that loads for each tank support will not exceed 50 kips.

We anticipate that traffic conditions for the pavement areas consist of passenger cars, delivery vehicles, garbage trucks and empty school buses. We have assumed truck traffic consisting of five delivery trucks per day, two semis and two garbage trucks per week. In addition to the truck traffic, we have included varying passes from unloaded school buses including 25, 50 and 100 buses per day.

If the proposed construction, tank loads or anticipated traffic is significantly different from what is described above, we should be notified so we can reevaluate the recommendations given.

RECOMMENDATIONS

Based on the subsurface conditions encountered, laboratory test results and the proposed construction, the following recommendations are given:



A. Site Grading

We do not expect there will be much change in grade at the site. Some minor changes to grades may be needed to provide good surface drainage.

1. <u>Subgrade Preparation</u>

Fill extending to depths of approximately 2 to 4½ feet below the pavement surface was encountered in the borings that were drilled in existing pavement areas. The fill encountered in the borings generally consists of sandy lean clay to clayey sand except in the upper portion of Borings B-1 and B-2 where it consists of silty sand with gravel. Topsoil overlying lean clay was encountered in the proposed pavement expansion area.

In existing pavement areas where the pavement is to be reconstructed, the existing asphaltic concrete should be removed and the area graded for placement of the recommended pavement section. The subgrade should be scarified to a depth of approximately 6 inches, the moisture adjusted to within 2 percent of the optimum moisture content and the subgrade compacted to at least 90 percent of the maximum dry density as determined by ASTM D 1557. The subgrade should be proof-rolled to identify soft areas. Soft areas should be removed and replaced with granular borrow consisting predominantly of gravel containing less than 15 percent passing the No. 200 sieve.

In pavement expansion areas, the topsoil, organics and other deleterious materials should be removed. The subgrade should be cut to undisturbed natural soil below the topsoil.

The upper natural soil and much of the existing fill consist of lean clay or have a high clay content. Access difficulties may be encountered for rubber-tired



construction equipment in the pavement expansion area and in existing pavement areas after the pavement has been removed when the upper soil is very moist to wet. Placement of approximately 1 to 2 feet of granular borrow may be needed to provide access for rubber-tired construction equipment when the upper soil is very moist to wet. Under these conditions, scarifying and recompacting the subgrade may not be practical and an alternative to scarifying and recompacting the subgrade would be to excavate to undisturbed soil and then place a sufficient thickness of granular borrow consisting predominantly of gravel containing less than 15 percent passing the No. 200 sieve to facilitate construction. Consideration may be given to placing a support fabric below the granular borrow.

2. <u>Excavation</u>

We anticipate that excavation at the site can be accomplished with typical excavation equipment. Excavation equipment with a flat cutting edge should be used when excavating for foundations to minimize disturbance of the bearing soil.

Temporary unretained excavations may be sloped at 1½ horizontal to 1 vertical or flatter in existing fill or natural sand. Temporary unretained excavations may be sloped at 1 horizontal to 1 vertical in the natural clay.

3. <u>Materials</u>

Materials used as fill for the project are anticipated to consist of imported fill and/or the on-site soil.

Structural fill placed to support foundations should consist of granular soil having less than 35 percent passing the No. 200 sieve, a maximum particle size of less than 4 inches and a liquid limit less than 30. The natural sand, existing base course and existing granular fill meeting the recommendations



given above may be considered for use as structural fill if organics, debris and other deleterious materials are removed.

Base course and granular borrow should meet APWA specifications. A base course sample tested from Boring B-1 does not meet APWA specifications for base course. The existing base course and/or pulverized asphaltic concrete mixed with base course are not recommended for reuse as base course, but may be considered for use as site-grading fill or granular borrow.

Depending on the moisture content of the fill at the time of construction, the fill may require wetting or drying prior to use. Drying of the fill may not be practical during cold or wet times of the year.

4. <u>Compaction</u>

Compaction of materials placed at the site should equal or exceed the minimum densities as indicated below when compared to the maximum dry density as determined by ASTM D 1557.

Fill To Support	Compaction
Foundations	\geq 95%
Concrete Flatwork	≥ 90%
Pavement Base Course Fill Placed Below Base Course	≥ 95% ≥ 90%
Landscaping	\geq 85%
Retaining Wall Backfill	85 - 90%

To facilitate the compaction process, fill should be compacted at a moisture content within 2 percent of the optimum moisture content.



The fill should be placed and compacted in thin enough lifts to allow for proper compaction. Fill placed for the project should be frequently tested for compaction during construction.

5. <u>Drainage</u>

The collection and diversion of drainage away from the pavement is important to the satisfactory performance of the pavement section and proper drainage should be provided.

B. Fuel Tank Foundations

1. Bearing Material

With the proposed construction and the subsurface conditions encountered, the proposed above-grade fuel tanks may be supported on spread footings bearing on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil.

Structural fill placed below footings should extend down to the undisturbed natural soil and out away from the edge of footings at least a distance equal to the depth of fill beneath footings.

Topsoil, organics, unsuitable fill and other deleterious materials should be removed from below proposed foundation areas.

2. Bearing Pressure

Spread footings bearing on the undisturbed natural soil or on compacted structural fill may be designed using an allowable net bearing pressure of 1,500 psf. Footings bearing on at least 2 feet of compacted structural fill may be designed for an allowable net bearing pressure of 3,500 psf.



3. <u>Settlement</u>

We estimate that total and differential settlement for foundations designed as indicated above will be less than $\frac{1}{2}$ inch.

4. <u>Temporary Loading Conditions</u>

The allowable bearing pressure may be increased by one-half for temporary loading conditions such as wind or seismic loads.

5. Frost Depth

Footings should be placed at least 30 inches below grade for frost protection.

6. Foundation Base

The base of foundation excavations should be cleared of loose or deleterious material prior to structural fill or concrete placement.

7. <u>Construction Observation</u>

A representative of the geotechnical engineer should observe footing excavations prior to structural fill or concrete placement.

C. Lateral Earth Pressure

1. <u>Lateral Resistance for Footings</u>

Lateral resistance for spread footings placed the natural soil or on compacted structural fill is controlled by sliding resistance between the footing and the structural fill or natural soil. A friction value of 0.35 may be used in design for ultimate lateral resistance. The passive resistance of soil adjacent footings may be used in lateral resistance design.



2. <u>Subgrade Walls and Retaining Structures</u>

The following equivalent fluid weights are given for the design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. The values listed below assume a horizontal surface adjacent the wall.

Soil Type	Active	At-Rest	Passive
Clay & Silt	50 pcf	65 pcf	250 pcf
Sand & Gravel	40 pcf	55 pcf	300 pcf

3. <u>Seismic Conditions</u>

Under seismic conditions, the equivalent fluid weight should be increased by 41 and 26 pcf for active and at-rest conditions, respectively, and decreased by 41 pcf for the passive condition. This assumes a peak horizontal ground acceleration of 0.68g which represents a 2 percent probability of exceedance in a 50-year period.

4. <u>Safety Factors</u>

The values recommended above assume mobilization of the soil to achieve the soil strength under active and passive conditions. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.



D. Seismicity, Faulting and Liquefaction

1. Seismicity

Listed below is a summary of the site parameters that may be used with the 2021 International Building Code.

Description	Value ¹
Site Class	D^2
S_s - MCE _R ground motion (period = 0.2s)	1.38g
S_1 - MCE _R ground motion (period = 1.0s)	0.49g
F_a - Site amplification factor at 0.2s	1.0
F_v - Site amplification factor at 1.0s	1.81
PGA - MCE _G peak ground acceleration	0.62g
PGA _M - Site modified peak ground acceleration	0.68g

¹Values obtained from information provided by the Applied Technology Council at https://hazards.atcouncil.org

 $^2 Site Class D$ was selected based on the subsurface conditions encountered at the site to the depth investigated and our understanding of the geologic conditions at the site.

2. Faulting

There are no mapped active faults extending through the project site. The closest mapped fault, which is considered active, is the Wasatch Fault, which has mapped traces extending approximately 4.7 miles east of the site (Utah Geological Survey, 2024).

3. Liquefaction

The site is located in an area mapped as having a "moderate" liquefaction potential (Salt Lake County, 2002). The soil type most susceptible to liquefaction during a large magnitude earthquake is loose, clean sand. The



liquefaction potential tends to decrease with an increase in fines content and density.

A site specific evaluation of the liquefaction hazard is beyond the scope of this report. However, based on subsurface conditions encountered to the depth investigated and our previous study for the Mount Jordan Middle School, liquefaction is not considered to be a significant hazard at this site since subsurface water was not encountered within a depth of 50 feet at the adjacent site.

E. Water Soluble Sulfates

Based on our experience in the area, significant water soluble sulfates are not anticipated in the natural soil. No special cement type is required for concrete placed in contact with the soil.

F. Pavement

Based on the subsoil conditions encountered, laboratory test results and the assumed traffic as indicated in the Proposed Construction section of the report, the following pavement support recommendations are given:

1. <u>Subgrade Support</u>

The upper natural soil and existing fill consists predominantly of lean clay. A California Bearing Ratio (CBR) of 3 percent was used for our analysis which assumes a lean clay subgrade.

2. <u>Pavement Thickness</u>

Based on the subsoil conditions encountered at the site, assumed traffic as described in the Proposed Construction section of the report and outlined in



the table below, a design life of 20 years for flexible pavement and 30 years for rigid pavement and methods presented by AASHTO, the following pavement sections have been calculated:

	Rigid Pavement		Flexible Pavement			
Traffic*	Portland	Asphaltic	Base	Granular		
	Cement Concrete	Concrete	Course	Borrow		
	Thickness	Thickness	Thickness	Thickness		
No Trucks or		3"	6"	_		
Buses	5"	—	—			
25 Buses/Day		3½"	6"	8"		
	5"	_	—	—		
50 Buses/Day	 5"	3½"	6" 	10" 		
100 Buses/Day		4"	6"	12"		
	5 ½ "	—		—		

*Buses are assumed to be unloaded school buses. In addition to buses, we have assumed 5 delivery trucks per day, 2 semis per week and 2 garbage trucks per week.

A pavement section consisting of 6½ inches of Portland cement concrete overlying 4 inches of base course is recommended for dumpster approach slabs.

3. <u>Pavement Material and Construction</u>

a. <u>Flexible Pavement (Asphaltic Concrete)</u>

The pavement materials should meet the material specifications for the applicable jurisdiction. The use of other materials may result in the need for different pavement material thicknesses.

b. Rigid Pavement (Portland Cement Concrete)

The design assumes that a concrete shoulder or curb will be placed at the edge of the pavement and that the pavement will have aggregate interlock joints.



The pavement materials should meet the material specifications for the applicable jurisdiction. The pavement thicknesses indicated above assume that the concrete will have a 28-day compressive strength of 5,000 pounds per square inch. Concrete should be air entrained with approximately 6 percent air. The maximum allowable slump will depend on the method of placement, but should not exceed 4 inches.

4. Jointing

Joints for concrete pavement should be laid out in a square or rectangular pattern. Joint spacings should not exceed 30 times the thickness of the slab. The joint spacings indicated should accommodate the contraction of the concrete and under these conditions steel reinforcing will not be required.

The depth of joints should be approximately one-fourth the slab thickness.

G. Preconstruction Meeting

A preconstruction meeting should be held with representatives of the owner, project architect, geotechnical engineer, general contractor, earthwork contractor and other members of the design team to review construction plans, specifications, methods and schedule.



LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the proposed construction, the information obtained from the borings drilled and the data obtained from field and laboratory testing. Variations in the subsurface conditions may not become evident until additional exploration or excavation is conducted. If the subsurface conditions or groundwater level is found to be significantly different from what is described above, we should be notified to reevaluate the recommendations given.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Jay R. McQuivey, P.E.

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Reviewed by Douglas R. Hawkes, P.E., P.G.

JRM/bw







LEGEND:

	Asphaltic Concrete.	1.	The borings were advanced on January 8, 2024 with direct push.
		2.	Locations of the borings were measured approximately by pacing from features shown on Figure 1.
	Base Course; poorly graded gravel with silt and sand, moist, brown.	3.	Elevations of the borings were measured by automatic level and refer to the benchmark shown on Figure 1.
፟	Fill; sandy lean clay to clayey sand, slightly moist to moist, brown to dark brown.	4.	The boring locations and elevations should be considered accurate only to the degree implied by the method used.
\boxtimes	Fill; silty sand with gravel, moist, light brown.	5.	The lines between materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
	Topsoil; lean clay with sand, slightly moist to moist, dark brown, roots.	6. 7.	No free water was encountered in the borings at the time of drilling. WC = Water Content (%);
	Lean Clay (CL); medium stiff to very stiff, slightly moist to very moist, brown to grayish brown, iron oxide staining.		DD = Dry Density (pcf); +4 = Percent Retained on the No. 4 Sieve; -200 = Percent Passing the No. 200 Sieve; UC = Unconfined Compressive Strength (psf); AC = Asphaltic Concrete Thickness:
	Poorly Graded Sand with Silt (SP-SM); small to moderate amount of silt, dense to very dense, slightly moist, brown.		BC = Base Course Thickness.
10/12	California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140-pound automatic hammer falling 30 inches were required to drive the sampler 12 inches.		

NOTES:



Applied Geotechnical Engineering Consultants, Inc.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Project No. 1230919

GRADATION TEST RESULTS

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I SUMMARY OF LABORATORY TEST RESULTS

SAMPLE GRADATION ATTERBERG LIMITS NATURAL NATURAL UNCONFINED WATER LOCATION MOISTURE COMPRESSIVE SOLUBLE DRY SILT/ SAMPLE CLASSIFICATION GRAVEL SAND LIQUID LIMIT PLASTICITY SULFATE CONTENT DENSITY STRENGTH BORING DEPTH CLAY (PCF) (PSF) (%) (%) (%) (%) (%) INDEX (%) Base Course; Poorly Graded B-1 4-12" 4 64 31 5 Gravel with Silt and Sand 2' 25 98 87 1,700 Lean Clay 5 4' 25 102 0 95 Lean Clay B-3 8' 2 109 0 93 7 Poorly Graded Sand with Silt B-5 2' 11 127 49 Fill; Clayey Sand

PROJECT NUMBER: 1230919

DOCUMENT 00 4113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 **BID INFORMATION**

- Bidder: Α.
- Project Name: CSD TRANSPORTATION FUEL TANK RELOCATION. Β.
- C. Project Location: Sandy, Utah.
- D. Owner: Corner Canyon School District.
- E. Architect: CORE Architecture.
- F. Architect Project Number: 23-089.
- 1.2 CERTIFICATIONS AND BASE BID
 - Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the A. Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Core Architecture and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum as listed on each line item below.
 - B. Enclosed herewith is a Bid Bond, Certified or Cashier's Check for Five Percent (5%) of my Base Bid amount, and I hereby agree if I am the successful Bidder, that its proceeds shall be forfeited to and become the property of the Owner in case I fail or refuse to enter into the Contract and furnish Bonds required with surety approved by you within five (5) calendar days after having been requested to do so by you.
 - C. I am prepared to furnish Performance and Payment Bonds in the amount of One Hundred Percent (100%) of my Base Bid, with ______ as Surety. I propose to have this company write my bond subject to your approval.
 - Enclosed is proof of Liability Insurance and Workmen's Compensation. D.
 - E. The following Addenda to the Contract Documents are acknowledged:

Addendum No	Dated
Addendum No	Dated
Addendum No	Dated

The undersigned further agree(s) to complete the work on or before the completion date specified in the Contract Documents.

TOTAL BASE BID

_____Dollars (\$______)

(In case of conflict, written amount shall govern)

This Base Bid Costs shall be good for 30 days after bid opening.

1.3 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in Salt Lake County, Utah, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.4 SUBMISSION OF BID

Α.	Respectfully submitted this	_ day of, <insert year="">.</insert>
В.	Submitted By: corporation).	(Name of bidding firm or
C.	Authorized Signature:	(Handwritten signature).
D.	Signed By:	(Type or print name).
E.	Title:	(Owner/Partner/President/Vice President).
F.	Witnessed By:	(Handwritten signature).
G.	Attest:	(Handwritten signature).
Н.	Ву:	(Type or print name).
I.	Title:	(Corporate Secretary or Assistant Secretary).
J.	Street Address:	
K.	City, State, Zip:	
L.	Phone:	
M.	License No.:	
N.	Federal ID No.:	(Affix Corporate Seal Here).

Sched	ule of Values			
Division	Title	Value	Proposed Sub-	Notes
			Contractor	
01	General Requirements			
02	Demolition			
03	Concrete			
04	Masonry			
05	Metals			
06	Wood/Plastics/Composites			
07	Thermal and Moisture			
	Protection			
08	Openings			
09	Finishes			
10	Specialties			
11	Equipment			
12	Furnishings			
13	Special Construction			
14	Conveying Equipment			
21	Fire Suppression			
22	Plumbing			
23	Heating, Ventilating, and Air			
	Conditioning			
25	Integrated Automation			
26	Electrical			
27	Communications			
28	Electronic Safety and Security			
31	Earthwork			
32	Exterior Improvements			
33	Utilities			
	Division Subtotal			
	Permitting Fees	Reimbursable	expense.	1
	Overhead and Profit			
	Total Proposed Cost			

DIVISION 01 – GENERAL REQUIREMENTS

- 01 1000 SUMMARY
- 01 2500 SUBSTITUTION REQUEST CSI Form 1.5C CSI Form 13.1A
- 01 2600 CONTRACT MODIFICATION PROCEDURES
- 01 2900 PAYMENT PROCEDURES
- 01 3100 PROJECT MANAGEMENT AND COORDINATION
- 01 3200 CONSTRUCTION PROGRESS DOCUMENTATION
- 01 3233 PHOTOGRAPHIC DOCUMENTATION
- 01 3300 SUBMITTAL PROCEDURES
- 01 4000 QUALITY REQUIREMENTS
- 01 4200 REFERENCES
- 01 5000 TEMPORARY FACILITIES AND CONTROLS
- 01 6000 PRODUCT REQUIREMENTS
- 01 7300 EXECUTION
- 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
- 01 7700 CLOSEOUT PROCEDURES
- 01 7823 OPERATION AND MAINTENANCE DATA
- 01 7839 PROJECT RECORD DOCUMENTS

ECTION 01 1100 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Various Scope of Work.
 - 4. Access to site.
 - 5. Coordination with occupants.
 - 6. Work restrictions.
 - 7. Specification and drawing conventions.
 - 8. Project Schedule.
- B. Related Section:
 - 1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
- 1.2 PROJECT INFORMATION
 - A. Project Identification: Canyon School District Transportation Fuel Tank Relocation.
 - 1. Project Location: 9300 South 200 East, Sandy, Utah 84070.
 - B. Architect: CORE Architecture, 233 South Pleasant Grove Blvd., Suite 105, Pleasant Grove, Utah 84062.
- 1.3 WORK COVERED BY CONTRACT DOCUMENTS
 - A. The Work of the Project is defined by the Contract Documents and consists of the following:
 - 1. The Work includes all of the work of Divisions 01 thru 33.
 - B. Type of Contract.
 - 1. Project will be constructed under a single prime contract.

1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Owner may award separate contract(s) for construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
- C. Concurrent Work: Owner may award separate contract(s) for concurrent construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

D. Subsequent Work: Owner may award separate contract(s) for subsequent additional work to be performed at site following Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. Nonsmoking Building: Smoking is not permitted within 25 feet (8 m) of entrances, operable windows, or outdoor air intakes.
- C. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.
- D. Staging: The Contractor must set up his temporary offices and other facilities as directed by Owner. The Contractor shall, as directed by Owner, secure the work area with temporary fencing and provide protected access to the facility.

1.9 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 the Drawings are described in detail in the Specifications. One or more of the following are used on the 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 and scheduled on Drawings.
 - 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 01 1100

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer an advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form provided in Project Manual that is part of web-based Project management software acceptable to Architect.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.

- h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
- i. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
- j. Cost information, including a proposal of change, if any, in the Contract Sum.
- k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
- I. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. The substitute request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. The substitute request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2500

SUBSTITUTION REQUEST (During the Bidding/Negotiating



Phase)

PROJECT:	SUBSTITUTION REQUEST NUMBER:			
	FROM:			
то:	DATE:			
	A/E PROJECT NUMBER:			
RE:	CONTRACT FOR:			
SPECIFICATION TITLE:	DESCRIPTION:			
SECTION: PAGE:	ARTICLE/PARAGRAPH:			
PROPOSED SUBSTITUTUION:				
MANUFACTURER: ADDRESS:	PHONE:			
TRADE NAME:	MODEL NO.:			
Attached data includes product description, specifications, c adequate for evaluation of the request; applicable portions Attached data also includes a description of changes to the require for its proper installation.	lrawings, photographs, and performance and test data of the data are clearly identified. Contract Documents that the proposed substitution will			
 The Undersigned certifies: Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product. Same warranty will be furnished for proposed substitution as for specified product. Same maintenance service and source of replacement parts, as applicable, is available. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule. Proposed substitution does not affect dimensions and functional clearances. Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution. 				
SUBMITTED BY:				
SIGNED BY:				
FIRM:				
ADDRESS:				
TELEPHONE:				
A/E's REVIEW AND RECOMMENDATION:				
Approve Substitution—Make submittals in accordance w	ith Specification Section 01 33 00 Submittal Procedures.			
Approve Substitution as noted—Make submittals in according Procedures.	ordance with Specification Section 01 33 00 Submittal			
Reject Substitution—Use specified materials.				
Substitution Request received too late—Use specified m	aterials.			
SIGNED BY:	DATE:			
SUPPORTING DATA ATTACHED: Drawings Product	t Data 🗌 Samples 🗌 Tests 🗌 Reports 🗌			
Page of	CSI Form 1.5C (August 2020 version)			

CSI grafts for Jantie Calles Collars and the colling of the collin



SUBSTITUTION

REQUEST (After the Bidding/Negotiating Phase)

Project:	Substitution Request	Number:
	From:	
То:	Date:	
	A/E Project Number:	
Re:	Contract For:	
Specification Title:	Description:	
Section: Page:	Article/Paragraph:	
Proposed Substitution:		
Manufacturer:		Phone:
Address:		
Trade Name:		Model No.:
Installer:		Phone:
Address:		
History: New product 1-4 years old	\Box 5-10 years old \Box More than 10 year	s old
Differences between proposed substitution and s	specified product:	
Deint hu neint comparative date attached		
Point-by-point comparative data attached —	REQUIRED BY A/E	
Reason for not providing specified item:		
Similar Installation:		
Project:	Architect:	
Address:	Owner:	
. <u></u>	Date Installed:	
Proposed substitution affects other parts of Wor	k: 🗌 No 🗌 Yes; explain	
Savings to Owner for accepting substitution:		(\$).
Proposed substitution changes Contract Time:	No Yes [Add] [Dec	duct]days.
Supporting Data Attached: Drawings	Product Data Samples	Fests Reports

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by:	
Signed by:	
Firm:	
Address:	
Telephone	
relephone.	
Attachments:	

A/E's REVIEW AND ACTION

 Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures. Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures. Substitution rejected - Use specified materials. Substitution Request received too late - Use specified materials. 					
Signed by:				Date:	
Additional Comments:	Contractor	Subcontractor	Supplier	Manufacturer	A/E

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
 - A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
 - B. Related Sections include the following:
 - 1. Section 01 6000 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 14 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and

activity relationship. Use available total float before requesting an extension of the Contract Time.

- 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- 1.4 CHANGE ORDER PROCEDURES
 - A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Work Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600
SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
 - A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
- 1.4 SCHEDULE OF VALUES
 - A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect through Construction Manager at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
 - B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets.
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.

- c. Name of subcontractor.
- d. Name of manufacturer or fabricator.
- e. Name of supplier.
- f. Change Orders (numbers) that affect value.
- g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
- 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
- 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
- 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
- 10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the fifth day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule (preliminary if not final).
 - 4. Products list.
 - 5. Schedule of unit prices.
 - 6. Submittals Schedule (preliminary if not final).
 - 7. List of Contractor's staff assignments.
 - 8. List of Contractor's principal consultants.
 - 9. Copies of building permits.
 - 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 11. Initial progress report.
 - 12. Report of preconstruction conference.
 - 13. Certificates of insurance and insurance policies.
 - 14. Performance and payment bonds.
 - 15. Data needed to acquire Owner's insurance.
 - 16. Initial settlement survey and damage report if required.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

- 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
- 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 6. AIA Document G707, "Consent of Surety to Final Payment."
 - 7. Evidence that claims have been settled.
 - 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 7300 "Execution" for procedures for coordinating general installation and fieldengineering services, including establishment of benchmarks and control points.
 - 3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such

conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 - 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 - 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 - 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 - 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 - 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 - 6. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
 - 7. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 3300 "Submittal Procedures."
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
 - 1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 - 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 - 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 - 4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
 - 5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
 - 6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
 - 7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 - 1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings.
 - 2. File Submittal Format: Submit or post coordination drawing files using PDF format.
 - 3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.

- a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
- 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in Revit 360.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.7 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Owner name.
 - 3. Owner's Project number.
 - 4. Name of Architect.
 - 5. Architect's Project number.
 - 6. Date.
 - 7. Name of Contractor.
 - 8. RFI number, numbered sequentially.
 - 9. RFI subject.
 - 10. Specification Section number and title and related paragraphs, as appropriate.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Field dimensions and conditions, as appropriate.
 - 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 14. Contractor's signature.
 - 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716.
 - 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.

- f. Requests for interpretation of Architect's actions on submittals.
- g. Incomplete RFIs or inaccurately prepared RFIs.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
- 3. Architect's action on RFIs that may result in a change to the Contract Time, or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 2600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number, including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.
 - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Digital Drawing Software Program: Contract Drawings are available in Revit 360. .
 - 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
 - 5. The following digital data files will be furnished for each appropriate discipline:
 - a. Floor plans.
 - b. Reflected ceiling plans.
- B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
 - 1. Web-based Project management software includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.

- b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
- c. Document workflow planning, allowing customization of workflow between project entities.
- d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
- e. Track status of each Project communication in real time, and log time and date when responses are provided.
- f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
- g. Processing and tracking of payment applications.
- h. Processing and tracking of contract modifications.
- i. Creating and distributing meeting minutes.
- j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
- k. Management of construction progress photographs.
- I. Mobile device compatibility, including smartphones and tablets.
- 2. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Critical work sequencing and long lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.

- f. Use of web-based Project software.
- g. Procedures for processing field decisions and Change Orders.
- h. Procedures for RFIs.
- i. Procedures for testing and inspecting.
- j. Procedures for processing Applications for Payment.
- k. Distribution of the Contract Documents.
- I. Submittal procedures.
- m. Preparation of Record Documents.
- n. Use of the premises.
- o. Work restrictions.
- p. Working hours.
- q. Owner's occupancy requirements.
- r. Responsibility for temporary facilities and controls.
- s. Procedures for moisture and mold control.
- t. Procedures for disruptions and shutdowns.
- u. Construction waste management and recycling.
- v. Parking availability.
- w. Office, work, and storage areas.
- x. Equipment deliveries and priorities.
- y. First aid.
- z. Security.
- aa. Progress cleaning.
- 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - I. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.

- w. Coordination with other work.
- x. Required performance results.
- y. Protection of adjacent work.
- z. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 - 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - I. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.
 - 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.

Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of sustainable design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site use.
 - 10) Temporary facilities and controls.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Status of RFIs.
 - 16) Status of Proposal Requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Construction Manager will conduct Project coordination meetings at weekly regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.

- 5) Deliveries.
- 6) Off-site fabrication.
- 7) Access.
- 8) Site use.
- 9) Temporary facilities and controls.
- 10) Work hours.
- 11) Hazards and risks.
- 12) Progress cleaning.
- 13) Quality and work standards.
- 14) Status of RFIs.
- 15) Proposal Requests.
- 16) Change Orders.
- 17) Pending changes.
- 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3100

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Daily construction reports.
 - 3. Site condition reports.
 - 4. Unusual event reports.
- B. Related Requirements:
 - 1. Section 01 4000 "Quality Requirements" for schedule of tests and inspections.
 - 2. Section 01 2900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
 - 3. Two paper copies of sufficient size to display entire period or schedule, as required.
 - B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
 - C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
 - D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - 3. Total Float Report: List of activities sorted in ascending order of total float.
 - E. Daily Construction Reports: Submit at monthly intervals.
 - F. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 COORDINATION

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

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

- 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
- 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
- 3. Procurement Activities: Include procurement process activities for the following long leadtime items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
- 4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
- 5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
- 6. Commissioning Time: Include no fewer than 15 days for commissioning.
- 7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- 8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 - 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.

- I. Building flush-out.
- m. Startup and placement into final use and operation.
- n. Commissioning.
- 6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 01 2900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.
- G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Final Completion percentage for each activity.
- H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
- 1.7 CPM SCHEDULE REQUIREMENTS
 - A. Prepare network diagrams using AON (activity-on-node) format.

- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Commissioning.
 - k. Punch list and Final Completion.
 - I. Activities occurring following Final Completion.
 - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 - 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.

- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 - 1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 - 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 - 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 - 4. Prepare list for ease of comparison with payment requests, coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.8 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Testing and inspection.
 - 8. Accidents.
 - 9. Meetings and significant decisions.

- 10. Unusual events.
- 11. Stoppages, delays, shortages, and losses.
- 12. Meter readings and similar recordings.
- 13. Emergency procedures.
- 14. Orders and requests of authorities having jurisdiction.
- 15. Change Orders received and implemented.
- 16. Construction Change Directives received and implemented.
- 17. Services connected and disconnected.
- 18. Equipment or system tests and startups.
- 19. Partial completions and occupancies.
- 20. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
 - 1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3200

SECTION 01 3233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final Completion construction photographs.
- B. Related Requirements:
 - 1. Section 01 7700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description in web-based Project management software site:
 - a. Name of Project.
 - b. Date photograph was taken.
 - c. Description of location, vantage point, and direction.

1.4 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Metadata: Record accurate date and time from camera.
- C. File Names: Name media files with date Project area and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.

- B. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Construction Manager.
 - 1. Flag excavation areas construction limits before taking construction photographs.
 - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- C. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work:
- D. Periodic Construction Photographs: Take 50 photographs coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Time-Lapse Sequence Construction Photographs: Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
 - 1. Frequency: Take photographs weekly, on the same day each week.
 - 2. Vantage Points: Following suggestions by Construction Manager and Contractor, photographer shall select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time, to create a time-lapse sequence as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.
 - d. Interior Work, through date of Substantial Completion.
- F. Final Completion Construction Photographs: Take 50 photographs after date of Substantial Completion for submission as Project Record Documents. Construction Manager will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3233

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 01 2900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 01 3100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 01 3233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
 - 5. Section 01 4000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 6. Section 01 7700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 7. Section 01 7823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

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

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

- 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
- 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
- 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's and Construction Manager's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Construction Manager.
 - 5. Name of Contractor.
 - 6. Name of firm or entity that prepared submittal.
 - 7. Names of subcontractor, manufacturer, and supplier.
 - 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 - 9. Category and type of submittal.
 - 10. Submittal purpose and description.
 - 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 12. Drawing number and detail references, as appropriate.
 - 13. Indication of full or partial submittal.
 - 14. Location(s) where product is to be installed, as appropriate.
 - 15. Other necessary identification.
 - 16. Remarks.
 - 17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 - 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 - 3. Paper: Prepare submittals in paper form and deliver to Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Construction Manager.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.

- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
 - 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.

- d. Sample source.
- e. Number and title of applicable Specification Section.
- f. Specification paragraph number and generic name of each item.
- 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
- 4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
- 5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
- 7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

- G. Certificates:
 - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 - 2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 - 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 - 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
 - 1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
 - 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 - 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 - 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 - 5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
 - 6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM Incorporation: Incorporate Construction Manager will incorporate delegated-design drawing and data files into BIM established for Project.
 - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in webbased Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
 - 2. Paper Submittals: Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
 - 3. Submittals by Web-Based Project Management Software: Architect and Construction Manager will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3300

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other qualityassurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.
 - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

- 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED DESIGN SERVICES

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

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply

with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

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

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

- B. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- C. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- D. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of technical representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement of whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.

- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement of whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in
- with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 10. Demolish and remove mockups when directed unless otherwise indicated.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspection allowances specified in Section 01 2100 "Allowances," as authorized by Change Orders.
 - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar qualitycontrol service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300 "Submittal Procedures."
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar qualitycontrol services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
 - 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 - 2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
 - 1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 - Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

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

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list 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." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AABC Associated Air Balance Council; <u>www.aabc.com</u>.
 - 2. AAMA American Architectural Manufacturers Association; (See FGIA).
 - 3. AAPFCO Association of American Plant Food Control Officials; <u>www.aapfco.org</u>.
 - 4. AASHTO American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC American Association of Textile Chemists and Colorists; <u>www.aatcc.org</u>.
 - 6. ABMA American Bearing Manufacturers Association; <u>www.americanbearings.org</u>.
 - 7. ABMA American Boiler Manufacturers Association; <u>www.abma.com</u>.
 - 8. ACI American Concrete Institute; (Formerly: ACI International); <u>www.concrete.org</u>.
 - 9. ACPA American Concrete Pipe Association; <u>www.concrete-pipe.org</u>.
 - 10. AEIC Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 - 11. AF&PA American Forest & Paper Association; www.afandpa.org.
 - 12. AGA American Gas Association; <u>www.aga.org</u>.
 - 13. AHAM Association of Home Appliance Manufacturers; <u>www.aham.org</u>.
 - 14. AHRI Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 15. AI Asphalt Institute; www.asphaltinstitute.org.
 - 16. AIA American Institute of Architects (The); <u>www.aia.org</u>.
 - 17. AISC American Institute of Steel Construction; <u>www.aisc.org</u>.
 - 18. AISI American Iron and Steel Institute; <u>www.steel.org</u>.
 - 19. AITC American Institute of Timber Construction; <u>www.plib.org</u>.
 - 20. AMCA Air Movement and Control Association International, Inc.; <u>www.amca.org</u>.
 - 21. ANSI American National Standards Institute; <u>www.ansi.org</u>.
 - 22. AOSA Association of Official Seed Analysts, Inc.; <u>www.aosaseed.com</u>.
 - 23. APA APA The Engineered Wood Association; <u>www.apawood.org</u>.
 - 24. APA Architectural Precast Association; www.archprecast.org.
 - 25. API American Petroleum Institute; www.api.org.
 - 26. ARI Air-Conditioning & Refrigeration Institute; (See AHRI).
 - 27. ARI American Refrigeration Institute; (See AHRI).
 - 28. ARMA Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
 - 29. ASCE American Society of Civil Engineers; <u>www.asce.org</u>.
 - 30. ASCE/SEI American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
 - 31. ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers; <u>www.ashrae.org</u>.
 - 32. ASME ASME International; (American Society of Mechanical Engineers); www.asme.org.
 - 33. ASSE American Society of Sanitary Engineering; www.asse-plumbing.org.
 - 34. ASSP American Society of Safety Professionals (The); <u>www.assp.org</u>.
 - 35. ASTM ASTM International; <u>www.astm.org</u>.
 - 36. ATIS Alliance for Telecommunications Industry Solutions; www.atis.org.
 - 37. AVIXA Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); <u>www.avixa.org</u>.
 - 38. AWEA American Wind Energy Association; <u>www.awea.org</u>.
 - 39. AWI Architectural Woodwork Institute; <u>www.awinet.org</u>.
 - 40. AWMAC Architectural Woodwork Manufacturers Association of Canada; <u>www.awmac.com</u>.
 - 41. AWPA American Wood Protection Association; www.awpa.com.
 - 42. AWS American Welding Society; <u>www.aws.org</u>.

- 43. AWWA American Water Works Association; www.awwa.org.
- 44. BHMA Builders Hardware Manufacturers Association; www.buildershardware.com.
- 45. BIA Brick Industry Association (The); <u>www.gobrick.com</u>.
- 46. BICSI BICSI, Inc.; <u>www.bicsi.org</u>.
- 47. BIFMA BIFMA International; (Business and Institutional Furniture Manufacturer's Association); <u>www.bifma.org</u>.
- 48. BISSC Baking Industry Sanitation Standards Committee; www.bissc.org.
- 49. BWF Badminton World Federation; (Formerly: International Badminton Federation); <u>www.bissc.org</u>.
- 50. CDA Copper Development Association; <u>www.copper.org</u>.
- 51. CE Conformite Europeenne; <u>www.ec.europa.eu/growth/single-market/ce-marking</u>.
- 52. CEA Canadian Electricity Association; <u>www.electricity.ca</u>.
- 53. CFFA Chemical Fabrics and Film Association, Inc.; <u>www.chemicalfabricsandfilm.com</u>.
- 54. CFSEI Cold-Formed Steel Engineers Institute; www.cfsei.org.
- 55. CGA Compressed Gas Association; <u>www.cganet.com</u>.
- 56. CIMA Cellulose Insulation Manufacturers Association; <u>www.cellulose.org</u>.
- 57. CISCA Ceilings & Interior Systems Construction Association; <u>www.cisca.org</u>.
- 58. CISPI Cast Iron Soil Pipe Institute; <u>www.cispi.org</u>.
- 59. CLFMI Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
- 60. CPA Composite Panel Association; <u>www.compositepanel.org</u>.
- 61. CRI Carpet and Rug Institute (The); <u>www.carpet-rug.org</u>.
- 62. CRRC Cool Roof Rating Council; <u>www.coolroofs.org</u>.
- 63. CRSI Concrete Reinforcing Steel Institute; <u>www.crsi.org</u>.
- 64. CSA CSA Group; www.csa-group.org.
- 65. CSI Cast Stone Institute; <u>www.caststone.org</u>.
- 66. CSI Construction Specifications Institute (The); <u>www.csiresources.org</u>.
- 67. CSSB Cedar Shake & Shingle Bureau; www.cedarbureau.org.
- 68. CTA Consumer Technology Association; <u>www.cta.tech</u>.
- 69. CTI Cooling Technology Institute; (Formerly: Cooling Tower Institute); <u>www.coolingtechnology.org</u>.
- 70. CWC Composite Wood Council; (See CPA).
- 71. DASMA Door and Access Systems Manufacturers Association; www.dasma.com.
- 72. DHA Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); <u>www.decorativehardwoods.org</u>.
- 73. DHI Door and Hardware Institute; www.dhi.org.
- 74. ECA Electronic Components Association; (See ECIA).
- 75. ECAMA Electronic Components Assemblies & Materials Association; (See ECIA).
- 76. ECIA Electronic Components Industry Association; <u>www.ecianow.org</u>.
- 77. EIA Electronic Industries Alliance; (See TIA).
- 78. EIMA EIFS Industry Members Association; <u>www.eima.com</u>.
- 79. EJMA Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
- 80. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
- 81. ESTA Entertainment Services and Technology Association; (See PLASA).
- 82. ETL Intertek (See Intertek); www.intertek.com.
- 83. EVO Efficiency Valuation Organization; www.evo-world.org.
- 84. FCI Fluid Controls Institute; www.fluidcontrolsinstitute.org.
- 85. FGIA Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
- 86. FIBA Federation Internationale de Basketball; (The International Basketball Federation); <u>www.fiba.com</u>.
- 87. FIVB Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
- 88. FM Approvals FM Approvals LLC; <u>www.fmapprovals.com</u>.
- 89. FM Global FM Global; (Formerly: FMG FM Global); <u>www.fmglobal.com</u>.
- 90. FRSA Florida Roofing, Sheet Metal Contractors Association, Inc.; <u>www.floridaroof.com</u>.
- 91. FSA Fluid Sealing Association; <u>www.fluidsealing.com</u>.
- 92. FSC Forest Stewardship Council U.S.; <u>www.fscus.org</u>.

- 93. GA Gypsum Association; <u>www.gypsum.org</u>.
- 94. GANA Glass Association of North America; (See NGA).
- 95. GS Green Seal; <u>www.greenseal.org</u>.
- 96. HI Hydraulic Institute; www.pumps.org.
- 97. HI/GAMA Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
- 98. HMMA Hollow Metal Manufacturers Association; (See NAAMM).
- 99. HPVA Hardwood Plywood & Veneer Association; (See DHA).
- 100. IAPSC International Association of Professional Security Consultants; www.iapsc.org.
- 101. IAS International Accreditation Service; www.iasonline.org.
- 102. ICBO International Conference of Building Officials; (See ICC).
- 103. ICC International Code Council; <u>www.iccsafe.org</u>.
- 104. ICEA Insulated Cable Engineers Association, Inc.; www.icea.net.
- 105. ICPA International Cast Polymer Association; www.theicpa.com.
- 106. ICRI International Concrete Repair Institute, Inc.; www.icri.org.
- 107. IEC International Electrotechnical Commission; <u>www.iec.ch</u>.
- 108. IEEE Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
- 109. IES Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); <u>www.ies.org</u>.
- 110. IESNA Illuminating Engineering Society of North America; (See IES).
- 111. IEST Institute of Environmental Sciences and Technology; <u>www.iest.org</u>.
- 112. IGMA Insulating Glass Manufacturers Alliance; (See FGIA).
- 113. IGSHPA International Ground Source Heat Pump Association; www.igshpa.org.
- 114. II Infocomm International; (See AVIXA).
- 115. ILI Indiana Limestone Institute of America, Inc.; <u>www.iliai.com</u>.
- 116. Intertek Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); <u>www.intertek.com</u>.
- 117. ISA International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); <u>www.isa.org</u>.
- 118. ISAS Instrumentation, Systems, and Automation Society (The); (See ISA).
- 119. ISFA International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); <u>www.isfanow.org</u>.
- 120. ISO International Organization for Standardization; <u>www.iso.org</u>.
- 121. ISSFA International Solid Surface Fabricators Association; (See ISFA).
- 122. ITU International Telecommunication Union; www.itu.int.
- 123. KCMA Kitchen Cabinet Manufacturers Association; www.kcma.org.
- 124. LMA Laminating Materials Association; (See CPA).
- 125. LPI Lightning Protection Institute; www.lightning.org.
- 126. MBMA Metal Building Manufacturers Association; www.mbma.com.
- 127. MCA Metal Construction Association; <u>www.metalconstruction.org</u>.
- 128. MFMA Maple Flooring Manufacturers Association, Inc.; <u>www.maplefloor.org</u>.
- 129. MFMA Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
- 130. MHI Material Handling Industry; <u>www.mhi.org</u>.
- 131. MIA Marble Institute of America; (See NSI).
- 132. MMPA Moulding & Millwork Producers Association; www.wmmpa.com.
- 133. MPI Master Painters Institute; www.paintinfo.com.
- 134. MSS Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; <u>www.mss-hq.org</u>.
- 135. NAAMM National Association of Architectural Metal Manufacturers; www.naamm.org.
- 136. NACE NACE International; (National Association of Corrosion Engineers International); www.nace.org.
- 137. NADCA National Air Duct Cleaners Association; <u>www.nadca.com</u>.
- 138. NAIMA North American Insulation Manufacturers Association; <u>www.nadca.com</u>.
- 139. NALP National Association of Landscape Professionals; www.landscapeprofessionals.org.
- 140. NBGQA National Building Granite Quarries Association, Inc.; www.nbgga.com.
- 141. NBI New Buildings Institute; <u>www.newbuildings.org</u>.

- 142. NCAA National Collegiate Athletic Association (The); <u>www.ncaa.org</u>.
- 143. NCMA National Concrete Masonry Association; <u>www.ncma.org</u>.
- 144. NEBB National Environmental Balancing Bureau; www.nebb.org.
- 145. NECA National Electrical Contractors Association; www.necanet.org.
- 146. NeLMA Northeastern Lumber Manufacturers Association; www.nelma.org.
- 147. NEMA National Electrical Manufacturers Association; www.nema.org.
- 148. NETA InterNational Electrical Testing Association; www.netaworld.org.
- 149. NFHS National Federation of State High School Associations; www.nfhs.org.
- 150. NFPA National Fire Protection Association; www.nfpa.org.
- 151. NFPA NFPA International; (See NFPA).
- 152. NFRC National Fenestration Rating Council; www.nfrc.org.
- 153. NGA National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
- 154. NHLA National Hardwood Lumber Association; www.nhla.com.
- 155. NLGA National Lumber Grades Authority; <u>www.nlga.org</u>.
- 156. NOFMA National Oak Flooring Manufacturers Association; (See NWFA).
- 157. NOMMA National Ornamental & Miscellaneous Metals Association; www.nomma.org.
- 158. NRCA National Roofing Contractors Association; www.nrca.net.
- 159. NRMCA National Ready Mixed Concrete Association; <u>www.nrmca.org</u>.
- 160. NSF NSF International; <u>www.nsf.org</u>.
- 161. NSI National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
- 162. NSPE National Society of Professional Engineers; <u>www.nspe.org</u>.
- 163. NSSGA National Stone, Sand & Gravel Association; <u>www.nssga.org</u>.
- 164. NTMA National Terrazzo & Mosaic Association, Inc. (The); <u>www.ntma.com</u>.
- 165. NWFA National Wood Flooring Association; <u>www.nwfa.org</u>.
- 166. NWRA National Waste & Recycling Association; www.wasterecycling.org.
- 167. PCI Precast/Prestressed Concrete Institute; www.pci.org.
- 168. PDI Plumbing & Drainage Institute; www.pdionline.org.
- 169. PLASA PLASA; (Formerly: ESTA Entertainment Services and Technology Association); www.plasa.org.
- 170. RCSC Research Council on Structural Connections; www.boltcouncil.org.
- 171. RFCI Resilient Floor Covering Institute; <u>www.rfci.com</u>.
- 172. RIS Redwood Inspection Service; www.redwoodinspection.com.
- 173. SAE SAE International; www.sae.org.
- 174. SCTE Society of Cable Telecommunications Engineers; www.scte.org.
- 175. SDI Steel Deck Institute; <u>www.sdi.org</u>.
- 176. SDI Steel Door Institute; <u>www.steeldoor.org</u>.
- 177. SEFA Scientific Equipment and Furniture Association (The); <u>www.sefalabs.com</u>.
- 178. SEI/ASCE Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
- 179. SIA Security Industry Association; www.siaonline.org.
- 180. SJI Steel Joist Institute; www.steeljoist.org.
- 181. SMA Screen Manufacturers Association; www.smainfo.org.
- 182. SMACNA Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
- 183. SMPTE Society of Motion Picture and Television Engineers; www.smpte.org.
- 184. SPFA Spray Polyurethane Foam Alliance; <u>www.sprayfoam.org</u>.
- 185. SPIB Southern Pine Inspection Bureau; www.spib.org.
- 186. SPRI Single Ply Roofing Industry; <u>www.spri.org</u>.
- 187. SRCC Solar Rating & Certification Corporation; www.solar-rating.org.
- 188. SSINA Specialty Steel Industry of North America; <u>www.ssina.com</u>.
- 189. SSPC SSPC: The Society for Protective Coatings; <u>www.sspc.org</u>.
- 190. STI Steel Tank Institute; <u>www.steeltank.com</u>.
- 191. SWI Steel Window Institute; <u>www.steelwindows.com</u>.
- 192. SWPA Submersible Wastewater Pump Association; www.swpa.org.

- 193. TCA Tilt-Up Concrete Association; <u>www.tilt-up.org</u>.
- 194. TCNA Tile Council of North America, Inc.; <u>www.tileusa.com</u>.
- 195. TEMA Tubular Exchanger Manufacturers Association, Inc.; <u>www.tema.org</u>.
- 196. TIA Telecommunications Industry Association (The); (Formerly: TIA/EIA Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
- 197. TIA/EIA Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
- 198. TMS The Masonry Society; <u>www.masonrysociety.org</u>.
- 199. TPI Truss Plate Institute; www.tpinst.org.
- 200. TPI Turfgrass Producers International; <u>www.turfgrasssod.org</u>.
- 201. TRI Tile Roofing Institute; <u>www.tileroofing.org</u>.
- 202. UL Underwriters Laboratories Inc.; <u>www.ul.com</u>.
- 203. UL LLC UL LLC; <u>www.ul.com</u>.
- 204. UNI Uni-Bell PVC Pipe Association; www.uni-bell.org.
- 205. USAV USA Volleyball; <u>www.usavolleyball.org</u>.
- 206. USGBC U.S. Green Building Council; <u>www.usgbc.org</u>.
- 207. USITT United States Institute for Theatre Technology, Inc.; www.usitt.org.
- 208. WA Wallcoverings Association; <u>www.wallcoverings.org</u>.
- 209. WCLIB West Coast Lumber Inspection Bureau; www.wclib.org.
- 210. WCMA Window Covering Manufacturers Association; <u>www.wcmanet.org</u>.
- 211. WDMA Window & Door Manufacturers Association; www.wdma.com.
- 212. WI Woodwork Institute; www.wicnet.org.
- 213. WSRCA Western States Roofing Contractors Association; <u>www.wsrca.com</u>.
- 214. WWPA Western Wood Products Association; <u>www.wwpa.org</u>.
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
 - 1. DIN Deutsches Institut fur Normung e.V.; <u>www.din.de</u>.
 - 2. IAPMO International Association of Plumbing and Mechanical Officials; <u>www.iapmo.org</u>.
 - 3. ICC International Code Council; <u>www.iccsafe.org</u>.
 - 4. ICC-ES ICC Evaluation Service, LLC; <u>www.icc-es.org</u>.
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
 - 1. COE Army Corps of Engineers; <u>www.usace.army.mil</u>.
 - 2. CPSC Consumer Product Safety Commission; <u>www.cpsc.gov</u>.
 - 3. DOC Department of Commerce; National Institute of Standards and Technology; <u>www.nist.gov</u>.
 - 4. DOD Department of Defense; www.quicksearch.dla.mil.
 - 5. DOE Department of Energy; www.energy.gov.
 - 6. EPA Environmental Protection Agency; <u>www.epa.gov</u>.
 - 7. FAA Federal Aviation Administration; <u>www.faa.gov</u>.
 - 8. FG Federal Government Publications; <u>www.gpo.gov/fdsys</u>.
 - 9. GSA General Services Administration; <u>www.gsa.gov</u>.
 - 10. HUD Department of Housing and Urban Development; <u>www.hud.gov</u>.
 - 11. LBL Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <u>www.eetd.lbl.gov</u>.
 - 12. OSHA Occupational Safety & Health Administration; <u>www.osha.gov</u>.
 - 13. SD Department of State; <u>www.state.gov</u>.
 - 14. TRB Transportation Research Board; National Cooperative Highway Research Program; The National Academies; <u>www.trb.org</u>.
 - 15. USDA Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; <u>www.ars.usda.gov</u>.

- 16. USDA Department of Agriculture; Rural Utilities Service; <u>www.usda.gov</u>.
- 17. USDOJ Department of Justice; Office of Justice Programs; National Institute of Justice; <u>www.ojp.usdoj.gov</u>.
- 18. USP U.S. Pharmacopeial Convention; <u>www.usp.org</u>.
- 19. USPS United States Postal Service; <u>www.usps.com</u>.
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. CFR Code of Federal Regulations; Available from Government Printing Office; <u>www.govinfo.gov</u>.
 - 2. DOD Department of Defense; Military Specifications and Standards; Available from DLA Document Services; <u>www.quicksearch.dla.mil</u>.
 - 3. DSCC Defense Supply Center Columbus; (See FS).
 - 4. FED-STD Federal Standard; (See FS).
 - 5. FS Federal Specification; Available from DLA Document Services; <u>www.quicksearch.dla.mil</u>.
 - a. Available from Defense Standardization Program; <u>www.dsp.dla.mil</u>.
 - b. Available from General Services Administration; <u>www.gsa.gov</u>.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; <u>www.wbdg.org</u>.
 - 6. MILSPEC Military Specification and Standards; (See DOD).
 - 7. USAB United States Access Board; <u>www.access-board.gov</u>.
 - 8. USATBCB U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; <u>www.bearhfti.ca.gov</u>.
 - 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; <u>www.calregs.com</u>.
 - 3. CDHS; California Department of Health Services; (See CDPH).
 - 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
 - 5. CPUC; California Public Utilities Commission; <u>www.cpuc.ca.gov</u>.
 - 6. SCAQMD; South Coast Air Quality Management District; <u>www.aqmd.gov</u>.
 - 7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; <u>www.txforestservice.tamu.edu</u>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
 - B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Use of Permanent Toilets: Use of Owner's existing toilet facilities is not permitted.
- B. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 1. Locate facilities to limit site disturbance as specified in Section 01 1000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- B. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- C. Waste Disposal Facilities: Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 01 1000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 31 1000 "Site Clearing."
- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4.
- 3.6 MOISTURE AND MOLD CONTROL
 - A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- 3.7 OPERATION, TERMINATION, AND REMOVAL
 - A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
 - B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
 - C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor.

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 01 2500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 01 4200 "References" for applicable industry standards for products specified.
 - 4. Section 01 7700 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

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

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 3300 "Submittal Procedures."
- F. Substitution: Refer to Section 01 2500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification Sections in Divisions 26 and 27 for additional equipment identification requirements.

1.5 COORDINATION

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.7 PRODUCT WARRANTIES

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

C. Submittal Time: Comply with requirements in Section 01 7700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
 - 1. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 - 2. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

- 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
- 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
- 3. Evidence that proposed product provides specified warranty.
- 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
- 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."
 - 1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
 - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Coordination of Owner-installed products.
 - 3. Progress cleaning.
 - 4. Starting and adjusting.
 - 5. Protection of installed construction.
 - 6. Correction of the Work.
- B. Related Sections include the following:
 - 1. Section 01 3300 "Submittal Procedures" for submitting surveys.
 - 2. Section 01 7329 "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 3. Section 01 7700 "Closeout Procedures" for submitting final Project Record Documents.

1.3 SUBMITTALS

- A. Landfill Receipts: Submit a copy of receipts issued by a landfill facility.
- PART 2 PRODUCTS (Not Used)
- PART 3 EXECUTION

3.1 EXAMINATION

- A. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- B. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
- 3.4 OWNER-INSTALLED PRODUCTS
 - A. Site Access: Provide access to Project site for Owner's construction forces.
 - B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

- 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
- 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
- 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- 3.8 CORRECTION OF THE WORK
 - A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
 - B. Restore permanent facilities used during construction to their specified condition.
 - C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
 - D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
 - E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

SECTION 01 7329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 02 through 48 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least ten (10) days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Primary operational systems and equipment.
 - 2. Air or smoke barriers.
 - 3. Fire-suppression systems.
 - 4. Mechanical systems piping and ducts.
 - 5. Control systems.
 - 6. Communication systems.
 - 7. Conveying systems.
 - 8. Electrical wiring systems.
 - 9. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 1. Water, moisture, or vapor barriers.
 - 2. Membranes and flashings.
 - 3. Exterior curtain-wall construction.
 - 4. Equipment supports.
 - 5. Piping, ductwork, vessels, and equipment.
 - 6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- B. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

- a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
- b. Restore damaged pipe covering to its original condition.
- 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
- E. Insert specific installation requirements if not specified elsewhere. Specific installation requirements are better specified in individual Sections.

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous construction waste.
 - 2. Disposing of nonhazardous construction waste.
- B. Related Sections include the following:
 - 1. Section 01 5000 "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Disposal: Removal off-site construction waste and deposit in landfill.

1.4 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for construction waste. 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 site-clearing and construction waste generated by the Work.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be recycled or disposed of in landfill. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 3. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. 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 three (3) 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.
- C. 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. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be recycled, remove waste materials from Project site and legally dispose of them in a landfill.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Section 01 2900 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Section 01 7300 "Execution" for progress cleaning of Project site.
 - 3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 48 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

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

- 13. Complete final cleaning requirements, including touchup painting.
- 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report and warranty.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three (3) copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.

e. Page number.

1.6 WARRANTIES

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- I. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Replace parts subject to unusual operating conditions.
- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- q. Clean ducts, blowers, and coils if units were operated without filters during construction.
- r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 3300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.

- 2. Two (2) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two (2) copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
- 1. Subject matter included in manual.
- 2. Name and address of Project.
- 3. Name and address of Owner.
- 4. Date of submittal.
- 5. Name and contact information for Contractor.
- 6. Name and contact information for Construction Manager.
- 7. Name and contact information for Architect.
- 8. Name and contact information for Commissioning Authority.
- 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
- 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required. (Submit three (3) CD's to District.)
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes. (Submit two (2) complete manuals to District).
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

- 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
- 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
- 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.

- 2. Performance and design criteria if Contractor has delegated design responsibility.
- 3. Operating standards.
- 4. Operating procedures.
- 5. Operating logs.
- 6. Wiring diagrams.
- 7. Control diagrams.
- 8. Piped system diagrams.
- 9. Precautions against improper use.
- 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:

- 1. Product name and model number.
- 2. Manufacturer's name.
- 3. Color, pattern, and texture.
- 4. Material and chemical composition.
- 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.

- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

- 3.1 MANUAL PREPARATION
 - A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
 - B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
 - C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
 - D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
 - E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 7823

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Miscellaneous record submittals.
- B. Related Sections:
 - 1. Section 01 7300 "Execution" for final property survey.
 - 2. Section 01 7700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 48 Sections for specific requirements for project record documents of the Work in those Sections.
- 1.3 CLOSEOUT SUBMITTALS
 - A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal: Submit one (1) paper copy set of marked-up record prints. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal: Submit one (1) paper copy set of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.
 - B. Record Specifications: Submit one (1) paper copy of Project's Specifications, including addenda and contract modifications.
 - C. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one (1) paper copy of each submittal.
 - D. Reports: Submit written report weekly indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one (1) set of marked-up paper copies of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - I. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

- 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
- 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
- B. Format: Submit record Specifications as marked up paper copy of Specifications.

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as paper copy.
 - 1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 7839

DIVISION 02 – EXISTING CONDITIONS

02 4119 SELECTIVE DEMOLITION

SECTION 02 4119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of the existing underground fuel tanks, pumps and associated utilities, replacement with new above ground fuel tanks, pumps and associated utilities.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and staging requirements.
 - 2. Section 01 7300 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

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

1.4 PREINSTALLATION MEETINGS

- A. Pre demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 4. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection and for noise control. Indicate proposed locations and construction of barriers.
- B. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations.

1.6 FIELD CONDITIONS

- A. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected before starting selective demolition operations.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

3.2 PROTECTION

A. Remove temporary barricades and protections where hazards no longer exist.

3.3 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Maintain fire watch during and for at least 12 hours after flame-cutting operations.
 - 4. Maintain adequate ventilation when using cutting torches.

- 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- 6. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 7419 "Construction Waste Management and Disposal."

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.5 CLEANING

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

END OF SECTION 02 4119

DIVISION 03 - CONCRETE

- 03 1000 CONCRETE FROMING AND ACCESSORIES
- 03 2000 CONCRETE REINFORCING
- 03 3000 CAST-IN-PLACE CONCRETE
- 03 3950 SEALER/HARDENER CONCRETE FLOOR FINISH

SECTION 03 1000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Form-facing material for cast-in-place concrete.

1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction, movement, contraction, and isolation joints
 - c. Forms and form-removal limitations.
 - d. Shoring and reshoring procedures.
 - e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
 - 1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
 - 2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of the Architect.
 - 3. Indicate location of waterstops.
 - 4. Indicate form liner layout and form line termination details.
 - 5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
 - 6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.
- B. Samples:
 - 1. For waterstops.
 - 2. For Form Liners: 12-inch by 12-inch sample, indicating texture.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

1.7 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 - 1. Build panel approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work.
- 1.8 DELIVERY, STORAGE, AND HANDLING
 - A. Form Liners: Store form liners under cover to protect from sunlight.
 - B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
 - C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
 - a. For architectural concrete specified in Section 03 3300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).
- B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:
 - a. Wind Loads: As indicated on Drawings.
 - 1) Horizontal Deflection Limit: Not more than 1/240 of the wall height.

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
 - 1. Provide continuous, true, and smooth concrete surfaces.

- 2. Furnish in largest practicable sizes to minimize number of joints.
- 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 3000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces without spiral or vertical seams not exceeding specified formwork surface class.
 - 1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.3 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

- 3.1 INSTALLATION OF FORMWORK
 - A. Comply with ACI 301.

- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 3000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
 - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beamgirder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
 - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
 - 5. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

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

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Inspections:
 - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
 - 2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 03 1000

SECTION 03 2000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel reinforcement bars.
 - 2. Welded-wire reinforcement.
- B. Related Requirements:
 - 1. Section 03 3000 "Cast-in-Place Concrete" for reinforcing used in concrete.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
 - 2. Bar supports.
 - 3. Mechanical splice couplers.
 - 4. Structural thermal break insulated connection system.
- B. Shop Drawings: Comply with ACI SP-066:
 - 1. Include placing drawings that detail fabrication, bending, and placement.
 - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - 3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
 - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
 - 2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:

- a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
- 2. Mechanical splice couplers.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.
 - 1. Store reinforcement to avoid contact with earth.
 - 2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
 - 3. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
 - 4. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

PART 2 - PRODUCTS

- 2.1 STEEL REINFORCEMENT
 - A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
 - B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.
 - C. Galvanized Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 - 2. Zinc Coating: ASTM A767/A767M, Class I zinc coated after fabrication and bending.
 - D. Epoxy-Coated Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 - 2. Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.
 - E. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.
 - F. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
 - G. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
 - H. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.
 - I. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
- C. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; compression-only type tension-compression type dowel-bar type mechanical-lap type.
- D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain ASTM A884/A884M, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch wire length.
- E. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- 3.2 INSTALLATION OF STEEL REINFORCEMENT
 - A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
 - B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
 - C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
 - D. Provide concrete coverage in accordance with ACI 318.
 - E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
 - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
 - 4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.
- G. Install structural thermal break insulated connection system in accordance with manufacturer's instructions.
- H. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel-reinforcement placement.
 - 2. Steel-reinforcement mechanical splice couplers.
 - 3. Steel-reinforcement welding.
- D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION 03 2000

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
- 1.3 DEFINITIONS
 - A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
 - B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review the following:
 - a. Construction joints, control joints, isolation joints, and joint-filler strips.
 - b. Concrete finishes and finishing.
 - c. Forms and form-removal limitations.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following.
 - 1. Portland cement.
 - 2. Fly ash.
 - 3. Aggregates.
 - 4. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
 - 5. Vapor retarders.
 - 6. Floor and slab treatments.
 - 7. Liquid floor treatments.
 - 8. Curing materials.
 - 9. Joint fillers.

- 10. Repair materials.
- B. Design Mixtures: For each concrete mixture, include the following:
 - 1. Mixture identification.
 - 2. Minimum 28-day compressive strength.
 - 3. Durability exposure class.
 - 4. Maximum w/cm.
 - 5. Calculated equilibrium unit weight, for lightweight concrete.
 - 6. Slump limit.
 - 7. Air content.
 - 8. Nominal maximum aggregate size.
 - 9. Steel-fiber reinforcement content.
 - 10. Synthetic micro-fiber content.
 - 11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 - 12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
 - 13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
 - 14. Intended placement method.
 - 15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Shop Drawings:
 - 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.
- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
 - 1. Concrete Class designation.
 - 2. Location within Project.
 - 3. Exposure Class designation.
 - 4. Formed Surface Finish designation and final finish.
 - 5. Final finish for floors.
 - 6. Curing process.
 - 7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer: Include copies of applicable ACI certificates.
 - 2. Ready-mixed concrete manufacturer.
 - 3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Curing compounds.
 - 4. Floor and slab treatments.
 - 5. Bonding agents.
 - 6. Adhesives.
 - 7. Vapor retarders.
 - 8. Semirigid joint filler.
 - 9. Joint-filler strips.
- C. Material Test Reports: For the following, from a qualified testing agency:

- 1. Portland cement.
- 2. Fly ash.
- 3. Aggregates.
- 4. Admixtures:
 - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.
- D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACIcertified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.
 - 1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- C. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as an ACI Concrete Field-Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
 - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

- 2.1 CONCRETE, GENERAL
 - A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.
- 2.2 CONCRETE MATERIALS
 - A. Source Limitations:
 - 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
 - 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 - 3. Obtain aggregate from single source.
 - 4. Obtain each type of admixture from single source from single manufacturer.
 - B. Cementitious Materials:
 - 1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
 - 2. Fly Ash: ASTM C618, Class C or F.
 - C. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
 - 2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - D. Air-Entraining Admixture: ASTM C260/C260M.
 - E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
 - F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, undefined:
 - a. Raven Industries, Inc.
 - b. Stego Industries, LLC.
 - c. W.R. Meadows, Inc.

2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, undefined:
 - a. BASF Corporation.
 - b. ChemMasters, Inc.
 - c. Curecrete Distribution Inc.
 - d. Euclid Chemical Company (The); an RPM company.
 - e. Laticrete International, Inc.
 - f. PROSOCO, Inc.
 - g. W.R. Meadows, Inc.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, undefined:
 - a. BASF Corporation.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. Laticrete International, Inc.
 - d. Nox-Crete Products Group.
 - e. Sika Corporation.
 - f. W.R. Meadows, Inc.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Water: Potable or complying with ASTM C1602/C1602M.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.7 REPAIR MATERIALS

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

- 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
- 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
- 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
- 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.9 CONCRETE MIXTURES

- A. Class: Normal-weight concrete used for footings, grade beams, and tie beams.
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Maximum w/cm: 0.45.
 - 3. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 - 4. Air Content:
 - a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
- B. Class: Normal-weight concrete used for foundation walls.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum w/cm: 0.45.
 - 3. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 - 4. Air Content:
 - a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.
- C. Class: Normal-weight concrete used for interior slabs-on-ground.
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content:

- a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
- D. Class: Normal-weight concrete used for interior suspended slabs.
 - 1. Exposure Class: ACI 318.
 - 2. Minimum Compressive Strength: 4000 psi at 28 days.
 - 3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
 - 4. Slump Limit: 4 inches, plus or minus 1 inch.
 - 5. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 - 6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd. 2.0 lb/yd.
- E. Class: Normal-weight concrete used for interior metal pan stairs and landings:
 - 1. Exposure Class: ACI 318.
 - 2. Minimum Compressive Strength: 3000 psi at 28 days.
 - 3. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 - 4. Maximum Size Aggregate: 1/2 inch.
 - 5. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
 - 6. Air Content: 3 percent, plus or minus 0.5 percent at point of delivery.
 - 7. Retarding Admixture: Not allowed.
 - 8. Accelerating Admixture: Not allowed.
- 2.10 CONCRETE MIXING
 - A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.
 - B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 - 1. Daily access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.

- 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
- 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 - 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 - 2. Face laps away from exposed direction of concrete pour.
 - 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 - 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 - 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 - 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls. unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 9200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
 - 1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 - 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

- d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed to public view.
 - 2. ACI 301Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: Apply to concrete surfaces refer to drawings.
- B. Hand-Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:
 1. Smooth-Rubbed Finish:
 - a. Perform no later than one day after form removal.
 - b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
 - c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.

3.8 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish:
 - 1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 - 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
 - 3. Apply float finish to surfaces to receive trowel finish.

- C. Trowel Finish:
 - 1. After applying float finish, apply first troweling and consolidate concrete by hand or powerdriven trowel.
 - 2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
 - 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 4. Do not add water to concrete surface.
 - 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 - 6. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
 - 2) Specified overall values of flatness, FF 25; and of levelness, FL 20; with minimum local values of flatness, FF 17; and of levelness, FL 15.
 - 3) Specified overall values of flatness, FF 35; and of levelness, FL 25; with minimum local values of flatness, FF 24; and of levelness, FL 17.
 - 4) Specified overall values of flatness, FF 45; and of levelness, FL 35; with minimum local values of flatness, FF 30; and of levelness, FL 24.
 - 5) Specified Overall Value (SOV): FF 50 and FL 25 with minimum local value (MLV): FF 40 and FL 17.
 - 6) Specified Overall Value (SOV): FF 25 and FL 20 with minimum local value (MLV): FF 17 and FL 15.
 - b. Suspended Slabs:
 - 1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
 - 2) Specified overall values of flatness, FF 25; and of levelness, FL 20; with minimum local values of flatness, FF 17; and of levelness, FL 15.
 - 3) Specified overall values of flatness, FF 35; and of levelness, FL 20; with minimum local values of flatness, FF 24; and of levelness, FL 15.
 - 4) Specified overall values of flatness, FF 45; and of levelness, FL 35; with minimum local values of flatness, FF 30; and of levelness, FL 24.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
 - 1. Coordinate required final finish with Architect before application.
 - 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Salt & Pepper Finish (Art Rooms)
 - 1. See 03 35 43 "Polished Concrete Finishes" for finish.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiberbristle broom perpendicular to main traffic route.
 - 2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
 - 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 - 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 - 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 4000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
 - 1. Cast-in inserts and accessories, as shown on Drawings.
 - 2. Screed, tamp, and trowel finish concrete surfaces.

3.10 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 - 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 - 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 - 3. If forms remain during curing period, moist cure after loosening forms.
 - 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
- d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
- e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Begin curing immediately after finishing concrete.
 - 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moistureretaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
 - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - Moisture-Retaining-Cover Curing: Cover concrete surfaces with moistureretaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
 - c. Floors to Receive Polished Finish: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.

- b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
- 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Curing Compound:
 - 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- e. Floors to Receive Curing and Sealing Compound:
 - 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than three days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 - 4. Rinse with water; remove excess material until surface is dry.
 - 5. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.
- 3.13 JOINT FILLING
 - A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s).
 - 2. Do not fill joints until construction traffic has permanently ceased.
 - B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
 - C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 - 1. Repair and patch defective areas when approved by Architect.
 - 2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces:
 - 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 3. After concrete has cured at least 14 days, correct high areas by grinding.
 - Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 a. Finish repaired areas to blend into adjacent concrete.
 - 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
 - 6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

- a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
- b. Dampen cleaned concrete surfaces and apply bonding agent.
- c. Place patching mortar before bonding agent has dried.
- d. Compact patching mortar and finish to match adjacent concrete.
- e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 - 2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
 - 1. Headed bolts and studs.
 - 2. Verification of use of required design mixture.
 - 3. Concrete placement, including conveying and depositing.
 - 4. Curing procedures and maintenance of curing temperature.

- 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
- 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 - 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 - 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; .
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 - Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
 - 8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - 9. When strength of field-cured cylinders is less than 85 percent of companion laboratorycured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 - 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - 12. Additional Tests:

6.

a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
- 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

- A. Protect concrete surfaces as follows:
 - 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items on concrete surfaces.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
 - 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 3000

SECTION 03 3950 - SEALER/HARDENER CONCRETE FLOOR FINISH

PART 1 - GENERAL

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

1.2 SUMMARY

- A. This Section includes the following:
 - Applying Sealer/Hardener to concrete floors scheduled and burnishing to develop sheen.
 Joint Sealant.
- B. Related Sections include the following:
 - 1. Section 03 3000 "Cast-in-Place Concrete".

1.3 REFERENCES

- A. ASTM C 779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- B. ASTM C 1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method; 1996.
- C. ASTM G23-81 Standard Practice for Operating Light Exposure Apparatus (Carbon-Arc Type) with and without Water Exposure of Nonmetallic Materials.
- D. ASTM C805 Standard Test Method for Rebound Number of Hardened Concrete.

1.4 SUBMITTALS

- A. See Section 01 6000 "Product Requirements".
 - 1. Provide submittal information within 10 calendar days after the contractor has received the Owner's Notice to Proceed.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Sealer/Hardener Concrete Finish schedule indicating locations and applications by manufacturer's name and product number.
 - 2. Product Data describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this Section.
 - 3. Preparation instructions and recommendations.
 - 4. Storage and handling requirements and recommendations.
 - 5. Installation methods and procedures, which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
 - 6. Maintenance data to include detailed instructions on recommended cleaning apparatus and cleaning solutions.

C. Submittals: For each finish specified submit seven (7) complete sets of manufacturer's latest published product data sheets, test data, maintenance data and material safety data sheets and other safety requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Quality Assurance:
 - 1. Submit manufacturer's certified test reports, prepared by an independent testing laboratory, confirming that products comply with specified performance criteria and are suitable for intended application.
- B. Applicator's Quality Assurance: Submit list of a minimum of five (5) completed projects of similar size and complexity to this Work. Include for each product:
 - 1. Project name and location.
 - 2. Name of Owner.
 - 3. Name of Contractor.
 - 4. Name of Architect.
 - 5. Name of Sealer/Hardener Concrete Finish applied.
 - 6. Approximate area of Sealer/Hardener Concrete Finish applied.
 - 7. Date of completion.
 - 8. Applicator shall be Certified Applicator of specified Sealer/Hardener Concrete Floor Finish and familiar with the specified methods needed for proper performance of work of this Section.
- C. Manufacturer's Certification:
 - 1. Provide a letter of certification from Sealer/Hardener manufacturer stating that the applicator is a Certified applicator of the manufacturer and is familiar with proper procedures and installation requirements required by the Manufacturer.

1.6 MOCK-UP

- A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship as required by the Architect.
- B. Prepare 10' x 10' mock-up for Sealer/Hardener specified, using same materials, tools, equipment, and procedures intended for actual surface preparation and application.
- C. Do not proceed with remaining work until workmanship and finish is approved by the Architect.
- D. Retain mock-ups to establish intended standards by which Sealer/Hardener Concrete Floor Finish system will be judged.
- E. Approved mock-ups may become part of the completed work if acceptable to the Architect.

1.7 PRE-INSTALLATION MEETING

- A. Convene a pre-application meeting before start of application of Sealer/Hardener Concrete Finish. Require attendance of parties directly affecting work of this Section, including Contractor, Architect, and Certified Applicator. Review the following:
 - 1. Environmental requirements.

- 2. Surface preparation.
- 3. Application and Burnishing.
- 4. Repair.
- 5. Field quality control.
- 6. Cleaning.
- 7. Protection of adjacent surfaces.
- 8. Coordination with other work and personnel.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project Site in original, factory sealed, unopened, new containers bearing manufacturer's name and label intact and legible, with the following information:
 - 1. Name or title of material.
 - 2. Manufacturer's standard container drum numbers.
 - 3. Application instructions.
 - 4. Maintain record of container drum numbers.
- B. Storage:
 - 1. Store materials in protected and well ventilated area at temperature between 40° and 90° degrees F., unless otherwise required by manufacturer.
 - 2. Keep containers sealed until ready for use.
 - 3. Do not use materials beyond manufacturer's shelf life limits.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.
- D. Empty drums will be retained at jobsite until Manufacturer's Representative verifies the proper amount of material has been used per the Manufacturer's recommendations.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with Sealer/Hardener Manufacturer's instructions.
- B. Surface Temperature: Minimum of 5 degrees F above dew point.
- C. Relative Humidity: Not above 85% and surface temperature is at least 5 degrees F above dew point.
- D. Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting Sealer/Hardener Concrete Floor Finish performance.
- E. Close areas to traffic during floor application and after application for time period recommended by Sealer/Hardener Concrete Floor Finish Manufacturer.

1.10 WARRANTY

- A. See Division 01 for additional warranty requirements.
- B. Sealer/Hardener: Manufacturer's and Certified Applicator's Joint Agreement for twenty (20) year material warranty and five (5) year labor warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Penetrating Sealer/Hardener Concrete Floor Finish: Ashford Formula, manufactured by Curecrete Chemical Company; Springville, Utah.
 - a. Contact: Brett Cline Surface Solutions (801) 330-5588.
 - 2. L&M "Seal Hard".
 - 3. Euclid "Diamond Head".
 - 4. Other Sealer/Hardener Concrete Floor Finishes will be acceptable if they meet or exceed the performance test data and meet requirements of the specified Concrete Floor Finish for its intended use and function as specified herein.
- B. Substitutions: See Section 01 6000 Product Requirements.
- 2.2 PENETRATING SEALER/HARDENER CONCRETE FLOOR FINISH
 - A. Basis of Design: Ashford Formula. Formulated to permanently seal, dustproof, increase abrasion resistance and develop permanent densification to concrete surfaces to which it is applied.
 - B. Description: Clear liquid form of silicate to permanently seal, dustproof and harden concrete surfaces and provide abrasion resistance by penetrating into concrete pores and chemically reacting. Chemically relies on an internal reaction, leaving no surface film or residue to densify pores. Products containing silicanantes, silicones, magnesium or lithium silicates will not be acceptable and will not be approved.
 - C. Performance Criteria:
 - 1. ASTM C 779, Abrasion: An improvement of 32.5% over untreated samples after 30 minutes.
 - 2. ASTM D 3359, Surface Adhesion: A 22% increase in adhesion over untreated samples, when tested with epoxy.
 - 3. ASTM C39 Compressive Strength. An increase of 40% over untreated samples after seven days.
 - 4. ASTM C 805 Impact Resistant. An increase of 13.3% over untreated samples when tested by Schmidt Hammer.
 - 5. Permeability: Sealed and treated surface allowed a rate of 0.00073 oz. (0.022cc) per hour when tested by a 7-foot (2.13 meter) head of water applied to 4.91 square inch (122224.71 mm) area.
 - 6. ASTM C 1028 Friction: No less than 0.86 result of coefficient of friction on sealed and treated dry surfaces and no less than 0.69 result of coefficient of friction on sealed and treated wet surfaces.
 - 7. ASTM G 23 Light Exposure. No adverse effects on sealed and treated samples.
 - 8. TTM-59, Chemical Resistance: No effect when exposed to alcohols, amines, alkaline detergents, ethers, Halogenated hydrocarbons, hydrocarbons, hydraulic fluids, ketones, oils and fuels. Moderate chemical resistance to some inorganic and organic acids.
 - D. Manufacturer's Technical Representative available to make site visits if requested by Architect.
 - E. Sealer/Hardener Concrete Finish Schedule:

1. Special Flooring, (SF-1): Ashford Formula applied at 200 SF per gallon.

2.3 JOINT SEALANT

- A. Product:
 - 1. "Crete Fill" by Curecrete of Springville, Utah, (800) 366-2254.
 - 2. Versaflex SL 85 by Versaflex of Kansas City, Kansas (913) 321-1416.
- B. Color: Custom color as selected by the Architect.
- C. Polyurea Joint Sealant, (non-staining) must meet specification requirements for compatibility with Sealer/Hardener Concrete Finish as recommended by manufacturer of concrete Sealer/Hardener.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with certified applicator (installer) present, for conditions affecting performance of Sealer/Hardener Concrete Finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
- B. Do not begin installation until substrates have been properly prepared and the floor surfaces are free of construction latents and foreign contaminants that will inhibit penetration of Sealer/Hardener and performance.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 SURFACE PREPARATION OF CONCRETE FLOORS

A. General:

- 1. Remove curing, sealing and coating agents, oil, breaking compound residue, wax and grease by scraping off heavy deposits mechanically or chemically to assure penetration of product into surface. Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water.
- 2. Remove dust and loose material by brushing, sweeping, vacuuming, and blowing with high pressure air.
- 3. Remove paint residue with solvent/stripper provided the stripper does not have an acidic pH.
- 4. Remove tire marks or any residue with compatible non-acidic degreaser or stripper as recommended by manufacturer. Mix proper dilution so that the chemical does not etch and open the pores of the concrete. Follow manufacturer's detailed instruction prior to mixing and removal.
- 5. Power rinse entire floor surface to thoroughly rinse and remove all soap residue or contaminants. Squeegee dry.
- B. Grind protrusions flush with surface. Patch voids, holes and cracks with recommended cementicious patching material compatible with Sealer/Hardener Concrete Floor Finish.
- C. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and all other contaminants.

D. Protect surrounding and adjacent surfaces in manner recommended by Sealer/Hardener Concrete Finish Manufacturer.

3.3 APPLICATION

- A. General:
 - 1. Apply Sealer/Hardener Concrete Finish in strict accordance with Manufacturer's latest printed instructions. Utilize manufacturer's recommended equipment for installation. Use low pressure drum pump with high volume sprayer or pour from drums or pails to flood surface during first coat application. Pump up sprayer may be used for applying spiff coat following manufacturer's recommended procedures.
 - 2. Application is to take place prior to any in-store accessory installation or as scheduled and coordinated by the Architect thus allowing as complete and uninhibited concrete slab area for installation.
 - 3. Only Manufacturer's Certified Applicator may apply Sealer/Hardener Concrete Finish. Applicable procedures must be followed as recommended by the Manufacturer.
 - 4. Manufacturer's Certified Applicator to install specified Sealer/Hardener Concrete finish in strict accordance with manufacturer's recommended procedures for each application as specified herein.
 - 5. Comply with recommendations of product manufacturer for drying time between succeeding coats.
 - 6. Recoat sealed floors where there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat free of other defects due to insufficient sealing or sheen. Apply additional Ashford Formula if required by Sealer/Hardener Concrete Finish Manufacturer or Architect.
 - 7. Remove defective floor areas visible and unacceptable to Sealer/Hardener Manufacturer or Architect in accordance with Sealer/Hardener Concrete Finish as specified herein.
 - 8. Make edges of Sealer/Hardener Concrete Finish adjoining other materials clean and sharp.
 - 9. Achieve water repellent surface, hardening, dustproofing, and abrasion resistance of concrete surfaces without changing the natural appearance of the concrete, except for the sheen.
 - 10. After spiff coat has been applied, burnish with high speed propane burnisher capable of a minimum of 2700 rpm equipped with a black stripping pad, followed by a purple pad and a blue burnishing pad or a hogs hair pad to develop sheen.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's representative must be available to provide technical assistance and guidance for surface preparation and application of Sealer/Hardener Concrete Finish.
- B. Sealer/Hardener Concrete Finish shall be inspected and acceptable to the Architect and the manufacturer of Sealer/Hardener Concrete Finish. Any area that is found unacceptable shall be repaired by the Certified Applicator as deemed necessary.

3.5 WORKMANSHIP AND CLEANING

- A. The premises shall be kept clean and free of debris at all times.
- B. Touch-up and restore finish where damaged.
- C. Remove spilled, splashed or splattered finish material from all surfaces, as required.

- D. Do not mar surface finish or item being cleaned. Make necessary repairs to damaged surfaces caused by cleaning operation or installation of Sealer/Hardener Concrete Finish.
- E. Remove debris from jobsite. Dispose of materials in separate, closed, sealed containers in accordance with local regulations.

3.6 PROTECTION

- A. Protect and prohibit traffic on Sealer/Hardener Concrete finished work according to manufacturer's instructions and recommendations.
- B. Barricade areas to protect Ashford Formula spiff coat until properly cured for traffic according to manufacturer's instructions and recommendations.
- C. Refer to manufacturer for materials used to cover and protect the flooring surfaces. Do not apply any tape to the floor as it will etch concrete surfaces.

3.7 SCHEDULES

A. Sealer/Hardener: Ashford Formula; penetrating Sealer/Hardener Concrete Finish, to be placed on interior exposed concrete floor surfaces in locations as detailed on drawings.

END OF SECTION 03 3950

05 5000 METAL FABRICATIONS

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

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

1.2 SUMMARY

A. Section Includes:1. Metal Bollards.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Fasteners.
 - 2. Shop primers.
 - 3. Shrinkage-resisting grout.
 - 4. Metal bollards.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Metal bollards.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- 1.6 QUALITY ASSURANCE
 - A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code Stainless Steel."

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide stainless steel fasteners for exterior use and zincplated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless steel fasteners for fastening aluminum stainless steel or nickel silver.
 - 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting."
- B. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normalweight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.6 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- thick, steel plate top.
 - 2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
 - 3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
- B. Fabricate sleeves for bollard anchorage from steel or stainless-steel pipe or tubing with 1/4-inchthick, steel or stainless-steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- C. Prime steel bollards with zinc-rich primer.
- 2.7 GENERAL FINISH REQUIREMENTS
 - A. Finish metal fabrications after assembly.
 - B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

PART 3 - EXECUTION

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

- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.
- 3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS
 - A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- 3.3 INSTALLATION OF METAL BOLLARDS
 - A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - 1. Do not fill removable bollards with concrete.
 - B. Anchor bollards in concrete in formed or core-drilled holes not less than 42 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
 - C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 - D. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 5000

09 9113 EXTERIOR PAINTING

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel.
 - 2. Galvanized metal.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 07 9200 "Joint Sealants" for painting of sealant.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI Standards.
- B. VOC Requirements:
 - 1. Products: Complying with V0C Requirements.

- C. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 2 Products.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (All paint materials are based on Kwal and Sherwin-Williams).
 - 1. Benjamin Moore & Co.
 - 2. Columbia Paint & Coatings.
 - 3. Dunn-Edwards Corporation.
 - 4. ICI Paints/PPG.
 - 5. Insl-x.
 - 6. Iowa Paint Manufacturing Company, Inc.
 - 7. Kwal Paint.
 - 8. Miller Paint.
 - 9. Porter Paints.
 - 10. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

- 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.
 - 1. Primer: One Coat, unless otherwise specified.
 - 2. Finish: Two Finish Coats.

2.3 PAINT, MATERIALS

- A. All Structural and Miscellaneous Steel Shall Receive:
 - 1. 1 Coat Sherwin-Williams B66-310 Series Pro Industrial Pro-Cryl Universal Primer.
 - 2. 2 Coats Sherwin-Williams B66W01151Pro Industrial DTM Acrylic Semi-Gloss Coating.
- B. All Galvanized Metal, Exposed Mechanical Units on Roof, Exposed Mechanical Vent Hoods, Sheet Metal Flashing, and Coated Sheet Metal Shall Receive:

(All galvanized metal should be wiped down with galva-prep like product.)

- 1. 1 Coat Sherwin-Williams B66-310 Series Pro Industrial Pro-Cryl Universal Primer.
- 2. 2 Coats Sherwin-Williams B66W01151Pro Industrial DTM Acrylic Semi-Gloss Coating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

- 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance of paint materials with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 9113

DIVISION 13 - SPECIAL CONSTRUCTION

- 13 1323 ABOVE GROUND FUEL STORAGE TANKS
- 13 3423.16 FABRICATED CONTROL BOOTH

SECTION 13 1323 - ABOVE GROUND FUEL STORAGE TANKS

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Above ground main tank design and product requirements.
 - B. Piping materials.
 - C. Fittings and valves.
 - D. Fuel pumps.
- 1.02 RELATED SECTIONS
 - A. Pipe markings, hangers, anchor sleeves, and other mechanical system hardware shall be in accordance with other sections of the Specifications.
 - B. Conduits, conductors, and electrical work shall be in accordance with other sections of the Specifications.
- 1.03 REFERENCES
 - A. American Society for Testing and Materials (ASTM):
 - B. National Fire Protection Association (NFPA):
 - 1. NFPA 30 Flammable and Combustible Liquids Code
 - 2. NFPA 54 National Fuel Gas Code
 - C. Underwriters Laboratories Inc. (UL):
 - 1. UL 142 Steel Above-ground Tanks for Flammable and Combustible Liquids.
 - 2. UL 2085 Protected Above-ground Tanks for Flammable and Combustible Liquids.
 - D. Environmental Protection Agency
- 1.04 SUBMITTALS
 - A. General: Refer to Section 01 3300 Submittal Procedures, Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
 - B. Submit the following:
 - 1. Shop drawings of tanks, containment basins, level and fuel transfer controls, drains, vents and connections.
 - 2. Layout and connection diagram showing location of all equipment, vents, grounding requirements and pipe routing.
 - 3. Tank manufacturer's product data.
 - 4. Certificates of Compliance: Manufacturer shall certify that tank will perform as specified.
 - 5. Test reports.

- 6. Installation instructions.
- 7. Tank foundation, mounting and seismic anchoring calculations and details.

PART 2 - PRODUCTS

- 2.01 ABOVE GROUND MAIN TANK DESIGN AND PRODUCT REQUIREMENTS
 - A. Protected, Secondary Containment Storage Tank for Flammable and Combustible Liquids.
 - B. Manufacture fuel tank in accordance with UL 2085. Tank shall be capable of storing petroleum products with specific gravity up to 1.1 including unleaded fuel, diesel fuel and DEF, at temperatures up to 150 degrees F.
 - C. Provide fill cap with provisions to be locked closed. Provide required vents (emergency and vapor) with rainproof caps. Provide level controls and alarm to indicate fuel level.
 - D. Provide stop cock and plug at tank drain. Provide isolation valve on tank discharge piping with provisions to be padlocked open.
 - E. Provide fuel distribution system in accordance with manufacturer's recommendations. Comply with recommended practices of NFPA.
 - F. The internal steel tank shall pass a 5 psig pressure test for a 24-hour period at the factory.
 - G. Tank(s) shall be tested in accordance with the Uniform Fire Code, Appendix IIF, Proposed Test Requirements for Protected Tanks: Standard 79-7 (including impact and ballistic tests).
 - H. The internal tank shall have an emergency vent as required by the NFPA and Uniform Fire Code.
 - I. The secondary containment shall be pressure tested to 15ml. Geomembrane and UL tested as a nonmetallic secondary containment, or may be steel located outside thermal physical protective material.
 - J. The outer steel tank shall have a 2" vent as required by UL 2085.
 - K. The internal and external steel tanks shall have continuous welds on all sides.
 - L. The steel tank openings shall be threaded except for the leak detector tubes.
 - M. The tank shall have a saddle support system that meets IBC seismic requirements.
 - N. Tanks and appurtenances shall have an exterior factory applied prime and finish coating of epoxy paint.
 - O. Tanks shall have warning signs to indicate FLAMMABLE, NO SMOKING, a NFPA Placard H=0, F=2, R=0 and #2 diesel
- 2.02 ABOVE GROUND TANK SCHEDULE:
 - A. Basis-of-Design: Modern Welding Co.
 - 1. 1,000-gallon tank for DEF storage.
 - 2. 10,000-gallon tank for Unleaded fuel.
 - 3. 12,000-gallon tank for Diesel fuel.

2.03 PIPING MATERIALS

- A. All piping shall be ASTM A53, schedule 40 black steel pipe.
- B. All underground piping shall be encased in a continuous schedule 40 PVC sleeve with terminations designed to prevent the intrusion of water.

2.04 FITTINGS AND VALVES

- A. All fittings shall be ANSI B16.3, 300-pound banded malleable iron, threaded. Connections between dissimilar pipe materials shall be isolated with insulating flanges, unions or gaskets as necessary.
- B. Fuel shutoff valves at the tank(s) shall be ball valves. Valves shall be brass or bronze bodied, stainless steel shaft, chrome plated or stainless steel ball with Teflon seat. Valves shall be rated at 150 psig WOG.
- C. Check valves shall be swing type, 150 psig rated, threaded, brass or bronze bodied, with removable stainless steel hinge pin and screwed cap.
- D. Pressure relief valves shall be 150 psig rated, threaded, brass or bronze bodied, and be adjustable from 20 to 100 psi.
- E. Anti-siphon valve(s): PVMC Type A, Universal 403, EBW 616-300 or equal.
- F. Provision for tank grounding shall be provided.

2.05 FUEL PUMPS

- A. Provide 120 VAC, single phase, TEFC motor driven, positive displacement gear pumps. Pumps shall be suitable for exterior service. Pumps shall be rated at 150 psig, cast iron with bronze bearings, mechanical seals and built in relief valve.
- B. Pumps and appurtenances shall be mounted in 304 stainless steel enclosures with adequate room to access and maintain the pump(s) and equipment.
- 2.06 FUEL LEVEL
 - A. All fuel tanks shall be refueled (and full) by the contractor prior to CSD acceptance.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install tanks and fuel distribution system as indicated, and in accordance with NFPA 30 and the manufacturer's installation instructions.
- B. Pitch both tanks 1/4-inch per foot forward toward drain plug.
- C. The main fuel storage tank shall be surrounded with concrete steel bollards.
- D. Mount fuel tank(s) on an integral concrete slab designed to support the loads.
- 3.02 FIELD QUALITY CONTROL
 - A. Prior to filling tanks, tanks and piping shall be tested in the presence of the Engineer as follows:
 - 1. Air Test: Tank(s) and associated piping shall be pressurized with air to 5 psig for a minimum

of 24 hours. The tank(s), fittings, and pipings shall have no more than a 1 psig drop over a period of 24 hours. Air gage shall be calibrated in 1/4 psig increments. Temperature shall be constant during the air test.

- 2. Soap Test: With tank(s) and associated piping pressurized at 5 psig, a 1 to 2 percent solution of household detergent in water shall be applied to exterior surface of tank with sponge or other acceptable means. Leaks revealed by bubbling of soap film shall be marked and, after tank is depressurized, repaired and retested until there are no leaks.
- 3. After testing, tank(s) and appurtenances shall be thoroughly cleaned and dried.

END OF SECTION 2313 23

SECTION 13 3423.16 - FABRICATED CONTROL BOOTHS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:1. Fabricated control booths.
- 1.2 ACTION SUBMITTALS

A. Product Data:

- 1. Fabricated aluminum control booths.
- B. Product Data Submittals: For each product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control booths.
 - 2. Include rated capacities, operating characteristics, and electrical characteristics, for included systems.
- C. Shop Drawings: For control booths. Include plans, elevations, sections, details, accessories, and fastening and anchorage details, including mechanical fasteners.
 - 1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates. Include location, diameter, and projection of anchor bolts required to attach control booths to foundation. Indicate post reactions at each location.
- 1.3 INFORMATIONAL SUBMITTALS
- 1.4 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For control booths to include in maintenance manuals.
- 1.5 WARRANTY
 - A. Special Warranty: Manufacturer agrees to repair finish or replace control booths that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Ten-years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design fabricated control booths.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 and marked for intended location and application.

2.2 FABRICATED CONTROL BOOTHS

- A. <u>Manufacturers:</u> Subject to compliance with requirements, provide product by the following:
 - 1. TUFFSHED Premier PRO Series Tall Ranch.
 - a. Size: 6'W x 6'L x 9'-10"H.

- b. Door: 3' x 6'-7" Single Residential 6-Panel Door.
- B. Structural Framework: Fabricated from 2-by-4 wood studs @ 16" o.c.
- C. Swinging Doors: 1-3/4 inches thick. Equip door with deadlock, three butt hinges, closer, and full weather stripping.
 - 1. Deadlock: Mortised, with lever handle and removable cylinder capable of being master keyed.
- D. Flat Roof/Ceiling Assembly: Assembly consisting of exterior roof panels, sloped to drain at booth perimeter.
- E. Work Counters: Full width of control booth (back wall).
 - 1. Material: 1/2-inch- thick particleboard with plastic-laminate finish.
 - 2. Depth: 20 inches.
- F. Electrical Power Service:
 - 1. Single-Point Connection: Service-entrance-rated, fused safety switch located on exterior for connection of 125 A, 120/208 V, single-phase, three-wire feeder with equipment ground conductor.
 - Grounding: Grounding electrode bonded to equipment ground conductor at single-point connection in accordance with NFPA 70 and Section 26 0526 "Grounding and Bonding for Electrical Systems."
 - 3. Power Distribution: Readily accessible panelboard in accordance with Section 26 2416 "Panelboards" installed at interior location coordinated with Architect. Include 25 percent provisions for installation of additional future devices.
 - 4. Power Connections:
 - a. One duplex, weatherproof, ground-fault circuit interrupter (GFCI), NEMA 5-15R power outlet(s) for servicing exterior equipment.
 - 5. Lighting:
 - a. Booth Interior: LED. Provide 20-fc average horizontal illuminance, with uniformity not exceeding 2:1 average-to-minimum on counter work surfaces.
 - b. Booth Exterior: LED, located above door. Provide not less than 0.5-fc average horizontal illuminance, with uniformity not exceeding 3:1 maximum-to-minimum, when measured at finished grade over the distance of 15 ft. from entrance door.
 - c. Controls: Provide manual switches for interior and exterior lighting on wall inside booth door Provide automatic photocontrol for interior and exterior lighting, with manual override located on wall inside booth door.
- G. Communications:
 - 1. One communications outlet(s) under counter(s) with four TIA-1096-A miniature eightposition series jack(s) for connecting telephone and data equipment.
- H. Accessories: Provide the following for each control booth:1. Bollards.
- I. Anchorage: Cast-in-place anchor bolts fabricated from stainless steel, with allowable load or strength design greater than or equal to the design load, as determined by testing conducted by a qualified testing agency.
- J. Materials:
 - 1. Plywood: DOC PS 1, Exterior grade.
 - 2. Particleboard: ANSI A208.1, Grade M-2.
- K. Painted Finish:

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

- A. Factory fabricate complete control booths, with accessories and options installed at factory.
- B. Factory prewire control booths, ready for connection to service at Project site.
- C. Fabricate control booths with removable lifting eye centered in roof.
- D. Accessible Control Booths: Where indicated to be accessible, fabricate control booths as follows:
 - 1. Provide door opening with minimum 32-inch clear width.
 - 2. Provide minimum 60-inch clear turning spacing within the booth.
 - 3. Provide minimum 27-inch clearance beneath interior work surfaces. Locate work surfaces 28 inches minimum and 34 inches maximum above the floor.
 - 4. Locate controls and operable parts no lower than 15 inches and no higher than 48 inches above the floor where reach is unobstructed. Where side reach is obstructed, locate controls and operable parts no lower than 15 inches and no higher than 46 inches above the floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including concrete bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before control booth installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install control booths in accordance with manufacturer's written instructions.
- B. Accessible Control Booths: Install with interior floor surface at same elevation as adjacent paved surfaces.
- C. Set control booths plumb and aligned. Level baseplates true to plane, with full bearing on concrete bases.
- D. Fasten control booths securely to concrete base with anchorage indicated.
- E. Connect to electrical power service and communication systems.
- 3.3 ADJUSTING
 - A. Adjust doors, operable windows, and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.

- B. Adjust interior and exterior lighting controls.
- C. Lubricate hardware and other moving parts.
- D. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 13 3423.16

DIVISION 26 - ELECTRICAL

26 0500	ELECTRICAL GENERAL PROVISIONS		
26 0502	ELECTRICAL SUBMITTALS AND O & M MANUALS		
26 0507	ELECTRICAL CONNECTIONS FOR EQUIPMENT		
26 0519	CONDUCTORS AND CABLES (600V AND BELOW)		
26 0529	SUPPORTING DEVICES		
26 0532	CONDUIT RACEWAYS		
26 0533	ELECTRICAL BOXES AND FITTINGS		
26 0548	ELECTRICAL SEISMIC CONTROL		
26 0553	ELECTRICAL IDENTIFICATION		
26 0923	OCCUPANCY SENSORS		
26 2416	PANELBOARDS		
26 2726	WIRING DEVICES		
26 2815	OVERCURRENT PROTECTIVE DEVICES		
26 2816	MOTOR AND CIRCUIT DISCONNECTS		
26 2913	MOTOR STARTERS		
26 4119	DEMOLITION		
26 5100	INTERIOR AND EXTERIOR BUILDING LIGHTING		
26 5600	EXTERIOR AREA LIGHTING		
	CSD – INFORMATION TECHNOLOGIES		

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.

1.2 DESCRIPTION OF WORK:

A. The extent of electrical work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items.

1.	Electrical General Provisions	26 0500
2.	Electrical Submittals and Spare Parts	26 0502
3.	Electrical Connections for Equipment	26 0507
4.	Conductors and Cables (600V and Below)	26 0519
5.	Supporting Devices	26 0529
6.	Conduit Raceway	26 0532
7.	Electrical Boxes and Fittings	26 0533
8.	Electrical Seismic Control	26 0548
9.	Electrical Identification	26 0553
10.	Occupancy Sensors	26 0923
11.	Panelboards	26 2416
12.	Wiring Devices	26 2726
13.	Overcurrent Protective Devices	26 2815
14.	Motor and Circuit Disconnects	26 2816
15.	Motor Starters	26 2913
16.	Demolition	26 4119
17.	Interior & Exterior Building Lighting	26 5100
18.	Exterior Area Lighting	26 5600
19.	Telephone & Data Systems CSD	27 1500
20.	Common Requirements ACS & VSS System	28 0501
21.	Access Control System	28 2205
22.	IP Video Surveillance System	28 2300

- B. Use of standard industry symbols together with the special symbols, notes, and instructions indicated on the drawings describe the work, materials, apparatus and systems required as a portion of this work.
- C. Visit the site during the bidding period to determine existing conditions affecting electrical and other work. All costs arising from site conditions and/or preparation shall be included in the base bid. No additional charges will be allowed due to inadequate site inspection.

1.3 DEFINITION OF TERMS

A. The following terms used in Divisions 26, 27 and 28 documents are defined as follows:

SECTION
- 1. "Provide": Means furnish, install and connect, unless otherwise indicated.
- 2. "Furnish": Means purchase and deliver to project site.
- 3. "Install": Means to physically install the items in-place.
- 4. "Connect": Means make final electrical connections for a complete operating piece of equipment.
- 1.4 RELATED SECTIONS:
 - A. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
 - B. General and Supplementary Conditions: Drawings and general provisions of contract and Division 1 of the Specifications, apply to all Division 26, 27 and 28 sections.
 - C. Earthwork:
 - 1. Provide trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, buried cable, in-grade pull boxes, manholes, lighting pole foundations, etc. See Division 31, Sitework, and other portions of Divisions 26, 27 and 28, for material and installation requirements.
 - D. Concrete Work:
 - 1. Provide forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, light pole foundations, pull box slabs, vaults, equipment pads, etc. See Division 3, Concrete for material and installation requirements.
 - E. Miscellaneous Metal Work:
 - 1. Provide fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor controls centers, etc. See Division 5, Metals for material and installation requirements.
 - F. Miscellaneous Lumber and Framing Work:
 - 1. Provide wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment. See Division 6, Rough Carpentry for material and installation requirements.
 - G. Moisture Protection:
 - Provide membrane clamps, sheet metal flashing, counter flashing, caulking and sealants as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors and ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vapor tight. See Division 7, Thermal and Moisture Protection for material and installation requirements.
 - H. Access panels and doors:
 - 1. Provide in walls, ceiling, and floors for access to electrical devices and equipment. See Division 8, Doors and Windows for material and installation requirements.
 - I. Painting:
 - 1. Provide surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, poles, surface metal raceways, etc. See Division 9, Finishes for material and installation requirements.
- 1.5 WORK FURNISHED AND INSTALLED UNDER ANOTHER SECTION REQUIRING CONNECTIONS UNDER THIS SECTION:
 - A. Provide electrical service, make requisite connections and perform operational test. Items furnished and installed under other sections and connected under this section, include but are not limited to the following:

- 1. Fuel Station Equipment
- 2. Propane Tank Equipment
- 3. Electric motors.
- 4. Package mechanical equipment: fans, fan coil units, pumps, boilers, duplex compressors, etc.
- 5. Flow switches and valve monitors.
- 6. Electric hardware.
- 7. Temperature control panels.
- 8. Variable frequency controllers.
- 9. Chiller starters.
- 10. Electric heat trace cable for domestic and industrial hot water piping systems.
- 11. Electric heat trace cable for guttering, drain lines, etc.
- 1.6 ITEMS FURNISHED UNDER ANOTHER DIVISION, BUT INSTALLED AND CONNECTED UNDER THIS DIVISION:
 - A. Items furnished under other Divisions, but turned over to Division 26 for installation and final connection include, but are not necessarily limited to, the following:
 - 1. Wall mounted control stations for motorized roll-up doors/grills.
 - 2. Wall mounted control stations for motorized projection screens.
 - 3. Wall mounted control stations for handicap lift.
- 1.7 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:
 - A. Before bidding, Contractor shall familiarize himself with the drawings, specifications and project site. Submit requests for clarification to Architect/Engineer in writing prior to issuance of final addendum. After signing the contract, the Contractor shall meet the intent, purpose, and function of the Contract Documents. Any costs of materials, labor and equipment arising therefrom, to make each system complete and operable, is the responsibility of the Contractor.
- 1.8 REQUESTS FOR INFORMATION (RFIs):
 - A. Contractor shall review all Contract Documents thoroughly before submitting an RFI to avoid unnecessary questions and ensure the question has not already been addressed within the existing Contract Documents.
 - B. RFIs should be used to seek clarification on issues or areas of confusion that cannot be resolved through a review of the Contract Documents.
 - C. Each RFI shall contain the following:
 - 1. Description of the Issue/Question: Clearly detail the issue or confusion, referencing the related Contract Document drawings and/or specifications.
 - 2. Relevant Documents: Attach any necessary supporting documents that could aid in understanding the RFI.
 - 3. Proposed Solution: Suggest a possible resolution to the problem or confusion.
 - D. Non-Compliant RFIs
 - 1. Frivolous or incomplete RFIs will not be accepted. RFIs that do not follow the guidelines set forth in this section, or are deemed unnecessary, may be returned without response at the discretion of the Engineer.

1.9 QUALITY ASSURANCE:

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies refers to the latest edition of such publications adopted and published prior to submittal of the bid proposed, unless noted otherwise herein. Such codes or standards are considered a part of this specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the Drawings and Specifications. Perform work in accordance with applicable requirements of all governing codes, rules and regulations including the following minimum standards, whether statutory or not:
 - 1. National Electric Code (NEC).
 - 2. International Building Code (IBC).
 - 3. International Fire Code (IFC).
 - 4. International Mechanical Code (IMC).
- C. Standards: Comply with the following standards where applicable for equipment and materials specified under this Division.
 - 1. UL Underwriters' Laboratories
 - 2. ASTM American Society for Testing Materials
 - 3. CBN Certified Ballast Manufacturers
 - 4. IPCEA Insulated Power Cable Engineers Association
 - 5. NEMA National Electrical Manufacturer's Association
 - 6. ANSI American National Standards Institute
 - 7. ETL Electrical Testing Laboratories
- D. All electrical apparatus furnished under this Section shall conform to (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.
- E. Comply with requirements of State and Local Ordinances. If a conflict occurs between these requirements and the Contract Documents, the most stringent requirements shall govern. The Contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the Contract Documents that may be in excess of the aforementioned requirements, and not contrary to same.
- F. Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.
- G. Employ only qualified craftsmen with at least three years of experience. Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices. Provide a competent superintendent to direct the work at all times. Any person found incompetent shall be discharged from the project and replaced by satisfactory personnel.
- H. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.

1.10 CONSTRUCTION CHANGE ORDER PROPOSALS

- A. In the event that a submission of a change order is issued by the contractor, the following information will be required to be submitted by the contractor, prior to any consideration by the owner/architect.
 - a. Where project manager or project engineer work is required, the labor cost shall not exceed 2% of the electrical portion of the change order.

- b. All equipment, including conduit and wire, shall be itemized, identifying unit costs and quantities of equipment. Distributor quotes shall accompany all change order requests. The distributor quotes shall include costs for all equipment including conduit and wire. Lot pricing for equipment is not acceptable.
- c. The general contractor shall review and confirm that the quantity and costs of materials submitted appear reasonable for the scope proposed.
- d. Labor units shall not exceed base NECA 1 standards. No adjustment factors shall be approved.
- e. Any research and labeling time, shall be the responsibility of the electrical contractor and shall not be included in the change order request.
- f. Any costs associated with the purchase of tools or transportation shall be fully itemized for review by architect/owner.
- g. Overtime rates shall only be approved where additional manpower cannot achieve the same result.
- h. Change order form shall follow the following format:
 - i. PCO number
 - ii. Detailed description of work being performed
 - iii. Location on project where work is performed
 - iv. Chosen NECA column
 - v. Identified material:
 - 1. QTY
 - 2. Unit cost
 - 3. Mark up
 - 4. Material total
 - vi. Identified labor:
 - 1. QTY
 - 2. Unit cost
 - 3. Composite labor rate
 - 4. Labor total

1.11 RECORD DRAWINGS:

- A. Contractor shall provide as-built drawings and a record model of the completed project, reflecting all deviations from the original design including but not limited to field conditions, RFIs, ASIs, and other modifications. The as-built drawings shall be provided in both Autodesk Revit and PDF formats.
- B. Maintain, on a daily basis, a complete set of "Record Drawings", reflecting an accurate record of work in accordance with the following:
 - 1. Show the complete routing and location of all feeders rated 100 amps and larger. Contractor shall clearly indicate dimensions on the drawings for work that is hidden beneath the ground or under slabs, concealed above ceiling structures, and within concealed spaces. These dimensions shall be measured from fixed structural elements, rather than from partition walls or other non-structural elements.
 - 2. Show the complete routing and location of all telecommunications conduits, systems raceways, and empty raceways, 1-1/4" and larger. Contractor shall clearly indicate dimensions on the drawings for work that is hidden beneath the ground or under slabs, concealed above ceiling structures, and within concealed spaces. These dimensions shall be measured from fixed structural elements, rather than from partition walls or other non-structural elements.
 - 3. Show all changes, deviations, addendum items, change orders, job instructions, etc., that change the work from that shown on the contract documents, including wall relocations, fixtures and device changes, branch circuiting changes, etc. Where locations of boxes, raceways, equipment, etc. are adjusted in the field to fit conditions, but such new locations may not be obvious by referring to the contract document, show new locations on the record drawings.
 - 4. Provide a copy of the raceway as-builts within the equipment rack for the system indicated below. Provide 11x17 size laminated prints that are legible.

- a. Telecommunications
- b. Audiovisual
- C. At the discretion of the Architect/Engineer, the drawings will be reviewed on a periodic basis and used as a pre-requisite for progress payments. This requirement shall not be construed as authorization for the Contractor to make changes in the layout, or work without written authorization for such changes.
- D. The Architect/Engineer shall review the drawings and the Contractor shall incorporate the resulting comments into the final record drawings.
- E. Certify the "Record Drawings" for correctness by placing and signing the following certifications of the first sheet of the drawings:

"CERTIFIED CORRECT (3/8" high letters)

(Name of General Contractor)

(Name of Electrical Contractor)

1.12 GUARANTEE:

- A. Ensure that electrical system installed under this contract is in proper working order and in compliance with drawings, specifications, and/or authorized changes. Without additional charge, replace any work or materials that develop defect, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.
- 1.13 OTHER:
 - A. Right to Hire. "Client" agrees that during the project and for a period of twenty four (24) months following substantial completion that it will not, directly or indirectly, employ or solicit to employ BNA Personnel.

PART 2 – PRODUCTS

- 2.1 GENERAL:
 - A. Products are specified by manufacturer name, description, and/or catalog number. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer who will issue interpretation and/or additional instructions to Bidders before the project is bid.

2.2 MANUFACTURERS:

A. Provide products of manufacturers specified. Manufacturers catalog numbers and descriptions establish the quality of product required. Substitutions will be considered if a duplicate written application (2-copies) is at the office of the Architect/Engineer eight (8) working days prior to the day of the bidding. The application shall include the following: 1)

A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.

- B. Any conflict arising from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.
- C. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.
- D. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued.
- E. Provide only equipment specified in the Contract Documents or approved by addendum.

2.3 SPARE PARTS:

A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Layout electrical work in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary for proper installation; perform with care. Use skilled mechanics of the trades involved. Repair damage to building and equipment at no additional cost to the contract. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting structural members shall not be permitted.
- B. Provide equipment enclosures appropriate to the environment to which they are installed. For example, provide NEMA 3R for exterior enclosures and NEMA 1 for interior enclosures unless otherwise noted.
- C. Since the drawings of floor, wall, and ceiling installation are made at small scale; outlets, devices, equipment, etc., are indicated only in their approximate location unless dimensioned. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned, and coordinate such locations with work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings, but refer to the architectural and mechanical shop drawings and project drawings for dimensions as applicable.
- D. Perform for other trades, the electrical wiring and connection for all devices, equipment or apparatus. Consult Architectural, Mechanical, and other applicable drawings, and all applicable shop drawings to avoid switches, outlets, and other equipment from being hidden behind doors, cabinets, counters, heating equipment, etc., or from being located in chalkboards, tackboards, glass panels, etc. Relocate buried electrical devices and/or connections as directed at no additional cost.
- E. Coordinate the location of outlets, devices, connections, and equipment with the supplier of the systems furniture prior to rough-in.
- F. Where conduit, outlets or apparatus are to be encased in concrete, it must be located and secured by a journeyman or foreman present at the point of installation. Check locations of the electrical items before and after concrete and/or masonry installation and relocate displaced items.
- G. Provide block-outs, sleeves, demolition work, etc., required for installation of work specified in this division.

3.2 CLEAN:

- A. Clean up all equipment, conduit, fittings, packing cartons and other debris that is a direct result of the installation of the work of this Division.
- B. Clean fixtures, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

3.3 POWER OUTAGES:

- A. All power outages required for execution of this work shall occur during non-standard working hours and at the convenience of the Owner. Include all costs for overtime work in bid.
- B. Submit written request at least 7 days in advance of scheduled outage and proceed with outage only after receiving authorization from the Owner's Representative.
- C. Keep all outages to an absolute minimum.

3.4 STORAGE AND PROTECTION OF MATERIALS:

A. Provide storage space for storage of materials and apparatus and assume complete responsibility for all losses due to any cause whatsoever. In no case shall storage interfere with traffic conditions in any public thoroughfare or constitute a hazard to persons in the vicinity. Protect completed work, work underway, and apparatus against loss or damage.

3.5 EXCAVATING FOR ELECTRICAL WORK:

- A. General: Locate and protect existing utilities and other underground work in manner that will ensure that no damage or service interruption will result from excavating and backfilling. Perform excavation in a manner that protects walls, footings, and other structural members from being disturbed or damaged in any way. Burial depths must comply with NEC Section 300-5 (or State of Utah requirement, whichever is more stringent), unless noted otherwise on drawings.
- B. Protect persons from injury at excavations, by barricades, warnings and illumination.
- C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.
- D. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install electrical work on frozen excavation bases or sub-bases.
- E. Do not excavate for electrical work until the work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum. See other sections of specification for additional requirements for excavating.
- F. Store excavated material (temporarily) near excavation, in a manner that will not interfere with or damage excavation or other work. Do not store under trees (within drip line).
- G. Retain excavated material that complies with requirements for backfill material. Dispose of excavated material that is either in excess of quantity needed for backfilling or does not comply with requirements for backfill material. Remove unused material from project site, and dispose of in lawful manner.

3.6 BACKFILL MATERIALS:

- A. For buried conduit or cable (other than below slab-on-grade, or concrete encased) 2" thickness of well graded sand on all side of conduit or cable.
- B. For trench backfill to within 6" of final grade soil material suitable for compacting to required densities.
- C. For top 6" of excavation Top soil.

- D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM D 1557), using power-driven hand-operated compaction equipment.
 - 1. Lawn/Landscaped Areas: 85 percent for cohesive soils, 95 percent for cohesionless soils.
 - 2. Paved Areas, Other than Roadways (90 percent for cohesive soils, 95 percent for cohesionless soils).
- E. Subsidence: Where subsidence is measurable or observable at electrical work excavations during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.7 CONCRETE BASES:

- A. Unless otherwise noted, provide 4" high reinforced concrete bases for all floor mounted or floor standing electrical equipment, including generators, transformers, switchgear, battery racks, motor control centers, etc. Extend bases 6" beyond equipment or mounting rails on all sides or as shown on the drawings. Notwithstanding this requirement, coordinate with equipment manufacturer, shop drawings, and height of base to ensure compliance with NEC 404.8.
- B. Concrete bases shall be provided under Divisions 26, 27 and 28. Coordinate size and location of all bases and furnish all required anchor bolts, sleeves, reinforcing and templates as required to obtain a proper installation.
- C. Provide and locate properly sized concrete pads for power company furnished pad mounted transformers in accordance with power company clearance requirements. Where the serving utility is Rocky Mountain Power, the electrical contractor shall conform to the requirements of Electrical Service Requirements, Section 6.4.

3.8 ROOF PENETRATIONS:

A. Where raceways penetrate roofing or similar structural area, provide appropriate roof jack coordinate with the roofing contractor and the Architect in order to match the vent with the roof construction. The jack shall be sized to fit tightly to raceway for weather-tight seal, and with flange extending a minimum of 9" under roofing in all sides or as required by the roof type of construction. Completely seal opening between inside diameter of roof flashing and outside diameter of penetrating raceways. Coordinate all work with work required under roofing section of specifications.

3.9 FIRE PENETRATION SEALS:

- A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after fire. The fire rating of the penetration seal shall be at least that of the floor, wall or ceiling that it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code. Where applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs, and similar structures. Where applicable, provide <u>3M</u> CID cast-in device for floor slabs. Where applicable, provide <u>3M</u> fire barrier sealing penetration system, and/or IPC Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps, and other accessories as required. All materials to comply with UL 1479 (ASTM E-814). Comply with manufacturer's instructions and recommendations for installation of sealing fittings and barrier sealing systems.
- 3.10 PROJECT FINALIZATION AND START-UP:
 - A. Upon completion of equipment and system installation, assemble all equipment Factory

Representatives and Subcontractors for system start-up.

- B. Each Representative and Subcontractor shall assist in start-up and check out their respective system and remain at the site until the total system operation is accepted by the Owner's representative.
- C. The Factory Representative and/or System Subcontractor shall give personal instruction on operating and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:
 - 1. This is to certify that the Factory Representative and System Subcontractor for each of the systems listed below have performed start-up and final check out of their respective systems.
 - 2. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system.

SYSTEMFACTORY REPRESENTATIVE(List systems included)(List name and address of Factory Representative)

Owner's Representative Contractor

- D. Send copy of acceptance to Architect/Engineer.
- 3.11 FINAL REVIEW:
 - A. At the time of final review, the project foreman shall accompany the reviewing party, and remove coverplates, panel covers and other access panels as requested, to allow review of the entire electrical system.

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to all Division 26, 27 and 28 sections.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.
- C. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 SUBMITTAL REQUIREMENTS:

- A. GENERAL:
 - 1. After the Contract is awarded but prior to ordering, manufacture, or installation of any equipment, prepare complete Submittals including shop drawings, product data, brochures, etc. for materials and equipment as required by each section of the specification.
 - 2. Review of Submittals shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from the Contract Document's requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Document's shall govern and are not waived, or superseded in any way by the review of the Shop Drawings and Brochures.
 - 3. Submittals are reviewed, not approved. Comments made within submittals do not alter the contract documents in any way. The contractor is still responsible, regardless of comments (if any) made within submittals, for complying with drawings and specifications.
 - 4. Notify engineer in writing if any of the comments noted in the submittals alter the contract cost. A comment within the submittal process which increases/decreases cost of product is not an authorization to the contractor under any circumstances to proceed.
 - 5. Notify engineer of any modifications between contract documents and submittals. It is the responsibility of the contractor to ensure compliance.
 - 6. ELECTRONIC SUBMITTAL REQUIREMENTS:
 - a. Provide submittals in Portable Document Format (PDF).
 - b. Documents must be electronically bookmarked by Division e.g. 26, 27 and 28, Specification section e.g. 26 0510 and individually for each item submitted for light fixtures, switchgear, transformer, panelboard etc. and keyword searchable using Adobe Acrobat (<u>http://www.adobe.com/acrobat</u>) or Bluebeam Revu (<u>http://www.bluebeam.com</u>) for each relevant section.
 - c. Electronically highlight <u>all options</u> for light fixtures, electrical equipment, etc. Manual highlighting and scanning of the documents is NOT acceptable and will NOT be reviewed.

- d. Provide only completed cutsheets for all fixture and equipment types. Blank cutsheets submitted with a schedule are NOT acceptable and will NOT be reviewed.
- e. At the time of submission, the electrical contractor shall provide a complete and comprehensive submission of all required specification sections/shop drawings at the same time. Exceptions may be given, with prior approval, for time-sensitive equipment.
- f. A maximum of one submittal per specification section is allowed. It is NOT acceptable to provide a product by product submittal. Single product by product submittals will NOT be reviewed.
- B. SCHEDULING
 - 1. GENERAL
 - a. A minimum period of two weeks, exclusive of transmittal time, will be required each time Submittals are submitted or resubmitted for review. This time period shall be considered by the Contractor when scheduling submittal data.
 - b. If the shop drawings are rejected twice, the contractor shall reimburse the engineering firm the sum of \$1,200.00 for the third review and any additional reviews required prior to the commencement of additional review.
- C. QUALITY ASSURANCE

C.

1. PRE-SUBMITTAL PREPARATION

- a. Prior to submission of the Shop Drawings and Project Data, review and certify that they are in compliance with the Contract Documents. Verify all dimensional information to ensure proper clearance for installation of equipment.
- b. Shop drawings requiring the use of electronic documents (floor plans, Lighting plans, fire alarm plans, etc.) shall be requested via a request for information (RFI) through the general contractor. Electronic documents will be provided to the Architect for distribution. No direct vendor requests will be accepted.
 - Contractor is completely responsible for the content of the submittal
- 2. SUBMITTAL REQUIREMENTS

i.

- a. Provide a stamp or statement on each submittal as follows:
 - I hereby certify that this Shop Drawing and/or Brochure has been checked prior to submittal and that it complies in all respects with the requirements of the Contract Drawings and Specifications for this Project.

(Name of Electrical Subcontractor)

Name_____.

Position_____Date____

- i. Failure to provide certification will result in submittals being rejected and returned without review.
- b. Brochures to be submitted as supplementary information shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs that describe several different items in addition to those items to be used, unless all

irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

- c. Shop Drawings shall be done in an easily legible scale and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Draftsmen skilled in this type of work. Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.
- d. Observe the following rules when submitting the Shop Drawings and Brochures.
 - i. Each Shop Drawing shall indicate in the lower right hand corner, and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Architect and Electrical Engineer, Contractor, Subcontractors, Manufacturer, Supplier/Vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included the submittal will be rejected and returned without being reviewed.
 - 1. Submittal Identification shall include the following:
 - a. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted.
 - b. Original submittal numbers shall have the following format: "XXX-Y;" where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals (for example, A, B, or C being the first, second, and third resubmittals, respectively). Submittal 25B, for example, is the second resubmittal of Submittal 25.

D. POST-SUBMITTAL

- 1. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents.
- 1.3 PROVIDE SUBMITTALS AS REQUESTED FOR EACH OF THE SECTIONS LISTED BELOW:

26 0519 Conductors and Cables

- 1. (600V and Below)
 - a. Submit megohmmeter test data for circuits under 600 volts. Megger all circuits of 100 amp and greater rating.
- 2. Provide complete parts list and installation manual for operation and maintenance as described in section 260500.
- B. 26 0526 Grounding
 - 1. Submit the name of test agency to be used for testing specified in this section. Submit results of tests specified in this section. Also include test results in Operation and Maintenance Manuals as specified.

- C. 26 0532 Conduit Raceway
 - 1. Submit manufacturer's data on MC-PCS Power & Control/Signal Cable.
- D. 26 0533 Electrical Boxes and Fittings
 - 1. Submit manufacturer's data including specifications, installation instruction and general recommendations for each type of floor box used on project.
- E. 26 0536 Raceway Systems
 - 1. Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of raceway as follows: Surface Metal Raceways, Underfloor metal raceways, Header Ducts for Cellular Metal Floor Deck Units, Cable Tray Systems, Overhead metal raceways, Wire basket cable tray systems
 - 2. Submit dimensioned drawings of raceway systems showing layout of raceways and fittings, spatial relationships to associated equipment, and adjoining raceways, for each type of raceway as follows: Surface metal Raceways, Underfloor Metal Raceways, Header Ducts for Cellular Metal Floor Deck Units, Cable Tray Systems, Overhead metal raceways, Wire basket cable tray systems
- F. 26 0548 Electrical Seismic Control
 - 1. A single submittal shall be provided for all seismic anchorage and restraints for all Division 26 equipment and systems provided as part of this project. Individual submittals for specific systems will not be accepted.
 - 2. Submit shop drawings, calculations, and printed data for the following items under provisions of the General Conditions of the Contract:
 - a. Complete engineering calculations and shop drawings for all seismic requirements for all equipment to be restrained as outlined in Section 26 0548 Specification, and as detailed on drawings.
 - b. The professional seal of the engineer who is responsible for the design of the Seismic Restraint System.
 - c. Details for all seismic bracing.
 - d. Details for steel frames, concrete inertia bases, and housekeeping pads. Include dimensions, embed depths, dowelling details, and concrete reinforcing requirements.
 - e. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing anchors, snubbers, cables, and bolt connections.
 - f. Floor plan noting the locations, size, and type of anchorage and restraint to be used.
 - g. Include confirmation that all calculations are based on the design criteria listed in appropriate Section.
 - h. Certificate of Compliance.
 - i. Where equipment is exempt per this specification provide a written certificate of compliance for each of the systems noted with the professional seal of engineer who has reviewed the electrical system.
- G. 26 0553 Electrical Identification
 - 1. Submit manufacturer's data on each type of electrical identification products
 - a. Submit one sample of each component of the electrical identification system as follows: Wire/cable tape marker, Tags, Engraved, plastic laminate labels, Arc-flash hazard labels

- H. 26 0573 Protective Device Study
 - 1. Submit partial study that includes the calculated values for short circuit current availability and arc flash levels for each switchgear bus, medium voltage controller, switchboard, low voltage motor control center, distribution panelboard, automatic transfer switch, and branch circuit panelboard. This data shall be submitted prior to, or at the same time as, submitting the entire electrical gear package. If partial study is not received prior to other submittals, the associated submittal will be rejected and not reviewed. Contractor shall utilize construction drawings to estimate approximate feeder lengths for this preliminary submittal. Submitted data shall include equipment/panel designations, feeder conductor sizes, feeder lengths, and calculated short circuit values and arc flash levels. Include the utility transformer ratings and transformer impedances used for the preparation of the short circuit calculations.
 - a. Partial study shall be submitted prior to switchboards, switchgear, panelboards, transformers, etc.
 - 2. Construction Period Submittal: During the construction period but prior to application of utility power to the electrical distribution system, submit an indexed copy of the complete protective device study based on actual field values. Include the following:
 - a. Introductory section with basic formulas, pertinent data, and rationale employed in the study.
 - b. One-line diagram for that portion of the system included in the study.
 - c. Calculations section showing tabulated calculations.
 - d. Results, recommendations, settings, etc.
 - 3. Provide one revision to study based on engineering review comments for the completed study to allow for minor modifications to adjustable circuit breakers to minimize arc flash levels.
- I. 26 0943 Lighting Control Equipment
 - 1. Submit manufacturer's data on lighting control equipment including, but not limited to published catalog data sheets, rough-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
 - 2. Submit detailed drawings and documentation of lighting control components and interconnection including, but not necessarily limited to:
 - a. Electronic controllers
 - b. Control stations
 - c. Photo sensors
 - d. Network wiring details
 - e. Input and output wiring details
 - f. Lighting control panel load schedules
 - g. Accurately scaled equipment layouts, wire/cable routing and connections to control wiring and electrical power feeders.
 - h. Submit scaled drawings/floor plans with locations of all equipment and devices clearly shown for installation purposes.
- J. 26 2200 Transformers
 - 1. Submit manufacturer's data on transformers, including certification of transformer performance efficiency, percentage regulation at 100 percent and 80 percent

power factor, no-load and full load losses in watts, percent impedance at 75 degrees C, hot-spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data. Before submitting product data, verify that dimensions of units to be supplied allow proper code required clearances adjacent to unit.

- 2. Submit dimensioned drawings of transformer installations, showing layout, mountings and supports, and spatial relationship to proximate walls and equipment.
- K. 26 2416 Panelboards
 - 1. Submit manufacturer's data and shop drawings only after completion of the preliminary protective device study (see Section 26 0573 as applicable). Any Section 26 2416 submittals received prior to submission of the preliminary protective device study will be REJECTED.
 - 2. Submit dimensioned drawings of panelboards and enclosures showing accurately scaled layouts of enclosures and required individual panelboard devices, including but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters, and accessories.
 - 3. Submit manufacturer data including specifications, installation instructions and general recommendations, for each type of panelboard required.
- L. 26 2726 Wiring Devices
 - 1. Submit manufacturer's data on electrical wiring devices.
- M. 26 2815 Overcurrent Protective Devices
 - 1. Submit manufacturer's data and shop drawings only after completion of the preliminary protective device study (see Section 26 0573 as applicable). Any Section 26 2815 submittals received prior to submission of the preliminary protective device study will be REJECTED.
 - 2. Submit manufacturer's data on overcurrent protective devices, including catalog cuts, time-current trip characteristic curves, and mounting requirements.
 - 3. Submit layout drawings of overcurrent protective devices, with layouts of circuit breakers, including spatial relationships to proximate equipment. Failure to submit said spatial layouts does not relieve contractor of responsibility to verify all required clearances before release of equipment for fabrication.
 - 4. Submit time-current trip curves (in log-log format) and trip setting parameter/range information (for each trip function) for all solid-state circuit breakers.
 - 5. Manufacturer shall also provide recommended trip settings with the shop drawing submittal (including ground fault settings) for coordination with downstream overcurrent devices. Manufacturer shall base recommendations on the AIC rating of the electrical equipment.
 - 6. Where the Protective Device Study specification section 260573 is included in the project, the time-current curves and recommended trip settings for all solid-state circuit breakers shall be submitted as part of the protective device study.
- N. 26 2816 Motor and Circuit Disconnects
 - 1. Submit manufacturer's data including specifications, installation and general recommendations, for each type of motor and circuit disconnect switch required.
 - 2. Submit dimensioned drawings of electrical motor and circuit disconnect switches that have rating of 100 amperes and larger.
- O. 26 2913 Motor Starters
 - 1. Submit manufacturer's data on motor starters.

- 2. Submit dimensioned drawings of motor starters showing accurately scaled equipment layouts.
- P. 26 4313 Surge Protective Devices (SPD)
 - 1. Submit manufacturer's data on SPD's listing all performance ratings specified or required herein.
 - 2. Submit dimensioned drawings of SPD's including, but not necessarily limited to, the following.
 - a. Complete data sheet.
 - b. Set of outline drawings giving complete mounting information, conduit entry and exit locations and dimensions, overall unit dimensions, weights, physical characteristics, etc.
 - c. Set of complete electrical drawings for power and control wiring.
 - d. Manufacturer's literature giving detailed information of equipment including parts numbers, model numbers and ratings.
 - e. UL 1449 suppressed voltage rating documentation.
- Q. 26 5600 Exterior Area Lighting
 - 1. Submit manufacturer's data on lighting units, including certified dimension drawings of components including, but not necessarily limited to, poles and standards, mast arms, brackets, hardware and fixtures.
- R. 27 1500 Telephone Data Systems
 - 1. Provide proof of RCDD certification and connectivity manufacturer certification.
 - 2. Provide submittals for all racks/cabinets; patch panels, devices, cabling, firestopping solutions, tray, non-continuous cable support devices, grounding equipment, and miscellaneous equipment to be used on project. Where multiple part numbers are listed on a datasheet/cutsheet, highlight or circle applicable part.
 - 3. Provide submittals showing complete racking layout in plan and elevation view to scale. Coordinate exact rack layout with Owner Information Technology Representative prior to submittal.
 - 4. Provide color samples of all available standard color faceplates to architect.
 - 5. Provide proposed labeling scheme for approval by owner/engineer.
 - 6. Provide catalog cutsheets of all test equipment that will be used.
- S. 28 2205 Access Control System
 - 1. Submit manufacturer's data sheets including specifications, installation instructions, and general recommendation for each type of equipment specified.
 - 2. Submit dimensioned drawings and schematics for design of system. Submit actual riser diagrams of complete system and elevations of required equipment. Typical risers are not acceptable.
 - 3. Provide a complete bill of materials for all components, accessories, and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
 - 4. Submit dimensioned drawings and device wiring layouts for all equipment.
 - 5. Submit equipment rack elevation diagrams (if applicable).
 - 6. Submit network switch port count and power requirements. Port count and POE switch requirements should be broken out per EF/ER/TR closet.
 - 7. Submit manufacturer certifications for all systems provided. Certifications must be

from local office providing the install.

- 8. Provide battery calculations to verify system standby time are required.
- 9. Provide a detailed scope of work document for all services provided.
- T. 28 2300 Video Surveillance Systems
 - 1. Provide a detailed scope of work document for all services provided.
 - 2. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the install.
 - 3. Product Data: Submit manufacturer's data on closed circuit television and recording systems equipment including, but not limited to, cameras, lens selections, recording server, mid-span unit, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
 - 4. Shop Drawings: Provide shop drawings showing:
 - a. Equipment/device locations and connecting wiring of entire CCTV system. Locations of all cameras with custom painted enclosures due to wood ceilings.
 - b. Include wiring diagrams and riser diagrams. Locations of all cameras, power supplies and controllers; point-to-point wiring diagrams for all devices. Include wiring diagrams for: cameras, environmental enclosures, pan-tilt-zoom mounts (if applicable); controllers; auxiliary devices.
 - c. Submit equipment rack elevation diagrams (if applicable).
 - d. Provide server calculations from Video Management System provider and camera manufacturer to validate proper server configuration and hard drive storage in submittals.
 - e. Mid-span power budget calculations showing power requirements for all cameras.
 - f. Submit network switch port count and power requirements. Port count and POE switch requirements should be broken out per IDF/MDF closet.
 - g. Dimensioned drawings shall show design intent for this specific job. Typical riser diagrams are not acceptable.
 - h.
 - 5. Provide a complete bill of materials for all components, accessories, and hardware to be provided in order to assemble a complete and working system as described within the contract documents.

1.4 RECORD DRAWINGS / OPERATION & MAINTENANCE MANUALS

- A. Provide operating instruction and maintenance data books for all equipment and materials furnished under this Division.
- B. Submit four copies of operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item. The binder (sized to the material) shall be a 2" slide lock unit (Wilson-Jones WLJ36544B). The cover shall be engraved with the job title in 1/2" high letters and the name and address of the Contractor in 1/4" high letters. Provide the same information in 1/8" letters on the spine.
- C. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete lists of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified).

- D. Include the following information where applicable.
 - 1. Identifying name and mark number.
 - 2. Certified outline Drawings and Shop Drawings.
 - 3. Parts lists.
 - 4. Performance curves and data.
 - 5. Wiring diagrams.
 - 6. Light fixture schedule with the lamps and ballast data used on the project for all fixtures
 - 7. Manufacturer's recommended operating and maintenance instructions.
 - 8. Vendor's name and address for each item.
- E. The engineer shall review the manuals and when approved, will forward the manuals on to the architect. If the manuals are rejected twice, the contractor shall reimburse the engineer the sum of \$1,200.00 for each review afterwards.
- F. Show all changes, deviations, addendum items, change orders, job instructions, etc., that change the work from that shown on the contract documents, including wall relocations, fixtures and device changes, branch circuiting changes, etc. Where locations of boxes, raceways, equipment, etc. are adjusted in the field to fit conditions, but such new locations may not be obvious by referring to the contract document, show new locations on the record drawings.
- G. Provide Operation and Maintenance Manual information for each section listed below in addition to the general requirements listed above.
 - 1. 26 0526 Grounding
 - a. Test Results of measured resistance values
 - 2. 26 0548 Electrical Seismic Control
 - a. Certificate of Compliance from Final Inspection
 - 3. 26 0943 Lighting Control Equipment
 - a. Record Drawings
 - i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
 - ii. Provide a CD to the owner containing the information specified below. The CD shall include all information required to allow the Owner to change the schedules themselves. The CD shall contain a minimum of following:
 - 1. CAD drawing files of 'as-built' lighting control components and point to point connections.
 - 2. General configuration programming.
 - 3. Job specific configuration programming to include schedule.
 - 4. Tutorial file on complete programming of lighting control system.
 - 4. 26 2913 Motor Starters
 - a. After installation is complete, including water and air balancing, measure voltage (L-L and L-N) and full load current of each phase of each motor. Submit report showing field readings of voltage, amperage, service factor,

and thermal heater size installed for each motor.

- 5. 27 1500 Telephone/Data System
 - a. Test Results as outlined in Section 27 1500
 - b. Manual shall include all service, installation, programming and warranty, including test results for each cable.
 - c. Provide laminated plans (minimum size 11 x 17) of all telecommunications record drawings (including riser diagrams) in each and every EF, ER and TR.
 - d. Record Drawings
 - i. The Owner shall provide electronic (DWG) format of telephone/data system drawings that as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.
 - ii. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment within 30 working days of completion. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.
- 6. 28 2205 Access Control Systems
 - a. Manual Requirements
 - i. Provide (2) copies and a USB drive with the following:
 - 1. All service, installation and programming information.
 - 2. All model numbers, service, installation, and programming information.
 - 3. Provide usernames and passwords within the O&M manual.
 - 4. Locations of all panels, power supplies and controllers; point-to-point wiring diagrams for all devices.
 - 5. Complete equipment list identifying: Type; model; manufacturer; manufacturer's data sheets.
 - 6. Network settings, including a list of IP and MAC addresses, username and passwords for network devices coordinated with door name and/or location.
 - 7. Serial and model numbers for all major components.
 - 8. Installation manuals and user manuals for all systems listed in these specifications.
 - 9. USB drive with any programming source code, drawing DWGs and PDFs, training videos

b. Record Drawings

- i. Locations of all panels, power supplies and controllers; point-to-point wiring diagrams for all devices.
- ii. Complete equipment list identifying: Type; model; manufacturer; manufacturer's data sheets.
- iii. Provide a complete set of CAD "AS-BUILT" Drawings showing installed wiring, wire paths, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
- iv. A building map (2 copies) shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building security map adjacent to the security control panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD security Access Control drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various by the use of different colors (minimum of five colors).
- 7. 28 2300 Video Surveillance System
 - a. Manual Requirements
 - i. Provide (2) copies and a USB drive with the following:
 - 1. All service, installation and programming information.
 - 2. All model numbers, service, installation, and programming information.
 - 3. Provide usernames and passwords within the O&M manual.
 - Locations of all panels, power supplies and controllers; point-to-point wiring diagrams for all devices.
 - 5. Complete equipment list identifying: Type; model; manufacturer; manufacturer's data sheets.
 - Network settings, including a list of IP and MAC addresses, username and passwords for network devices coordinated with door name and/or location.
 - 7. Serial and model numbers for all major components.
 - 8. Installation manuals and user manuals for all systems listed in these specifications.
 - 9. USB drive with any programming source code, drawing DWGs and PDFs, training videos
 - 10. Installers and Manufacturer's Contact Information
 - b. Record Drawings

- i. Locations of all panels, power supplies and controllers; point-to-point wiring diagrams for all devices.
- ii. Complete equipment list identifying: Type; model; manufacturer; manufacturer's data sheets.
- iii. Provide a complete set of CAD "AS-BUILT" Drawings showing installed wiring, wire paths, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
- c. A building map (2 copies) shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building security map adjacent to the security control panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD security Video Surveillance drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various by the use of different colors (minimum of five colors).28 3113 Fire Alarm and Detection System
- d. Manual Requirements
 - i. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.
- e. Record Drawings
 - i. A complete set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system. Vendor shall not request drawings from the Engineer. Vendor shall request current architectural drawings from the Architect and include all cost with bid.
 - ii. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel and all remote operating panels. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various devices and wiring by the use of different colors (minimum of five colors).
 - iii. Provide a CD to the Owner containing the information specified below. The CD shall include all information required to allow the Owner to change the fire alarm program themselves. The CD shall contain a minimum of the following:
 - 1. CAD drawing files of building fire alarm map.
 - 2. CAD drawing files of as-built fire alarm components and point to point connections.
 - 3. General configuration programming.

- 4. Job specific configuration programming.
- 5. Tutorial file on complete programming of fire alarm system

1.5 SPARE PARTS:

A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Stock of all spare items shall be delivered as directed to Owner's storage space prior to substantial completion. All components shall be labeled to match construction document nomenclature.

Section	Section Name	Description	Qty. Required	Qty. Received	Fulfille d?
26 0532	Conduit Raceway	Provide 1000 feet of ³ ⁄ ₄ " conduit with 3 #12 conductors and 1000 feet of ³ ⁄ ₄ " conduit with 3 #10 conductors. Provide all supports, fittings, boxes, terminations, etc. as required for installation. Install only as directed by engineer. Credit back all unused material and labor to Owner.	Per description		
26 2815	Overcurrent Protective Devices	For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than two units of each size and type, unless specified otherwise in another section of these specifications.	Per description		
26 2816	Motor and Circuit Disconnects	Spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size.	Per description		
26 2913	Motor Starters	Maintenance Stock Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 10 installed, but not less than 5 units of each, for both power and control circuit fuses.	Per description		
26 5600	Exterior Area Lighting	Provide (3) spare fuses for each type and size used.	Per description		
28 2300	Access Control System	Card Reader for each specified type, including 20 feet of conduit with wiring (completely installed and wired) for each spare device	2		

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SECTION 260507 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-23 section making reference to electrical connections.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical connection for equipment includes final electrical connection of all equipment having electrical requirements. Make final connections for all owner furnished equipment. See other applicable portions of specification for building temperature control wiring requirements.
- B. Refer to Division-23 sections for motor starters and controls furnished integrally with equipment; not work of this section.
- C. Refer to Division-23 section for control system wiring; not work of this section.
- D. Refer to sections of other Divisions for specific individual equipment power requirements.
- E. Make final connections for Fuel Pump Dispenser equipment in accordance with manufacturer's recommendations.

1.3 QUALITY ASSURANCE:

- A. NEC COMPLIANCE: Comply with applicable portions of NEC as to type products used and installation of electrical power connections.
- B. UL LABELS: Provide electrical connection products and materials that have been UL-listed and labeled.

PART 2 - PRODUCTS

- 2.1 GENERAL:
 - A. For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, raceways, conductors, cords, cord caps, wiring devices, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices, terminations, and connections as required. Crimp on or slip-on type splicing materials (insulation displacement type) designed to be used without wire stripping are not acceptable. See Section 26 0532, Conduit Raceways; Section 26 2726 Wiring Devices: and Section 26 0519 Conductors and Cables for additional requirements. Provide final connections for equipment consistent with the following:
 - 1. Permanently installed fixed equipment flexible seal-tite conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.
 - 2. Movable and/or portable equipment wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).

3. Other methods as required by the National Electrical Code and/or as required by special equipment or field conditions.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS:

- A. Make electrical connections in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams.
- C. Coordinate installation of electrical connections for equipment with equipment installation work.
- D. Verify all electrical loads (voltage, phase, horse power, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under other Divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review equipment electrical characteristics. Report any variances from electrical characteristics noted on the electrical drawings to Architect before proceeding with roughwork. In summary it is not in the Electrical Engineers scope to review the shop drawings from other trades/divisions.
- E. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.
- F. Refer to basic materials and methods Section 26 0553 Electrical Identification, Conductors, for identification of electrical power supply conductor terminations.

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to conductors and cables specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical conductor and electrical cable work is indicated by drawings and schedules.
- B. Types of conductors and cables in this section include the following:
 - 1. Copper Conductors (600V)
 - 2. Aluminum Conductor (600V)
- C. Applications for conductors and cables required for project include:
 - 1. Power Distribution
 - 2. Feeders
 - 3. Branch Circuits
 - 4.
- 1.3 RECORDS SUBMITTAL: Refer to Section 26 0502 for requirements.
- 1.4 QUALITY ASSURANCE:
 - A. Comply with NEC as applicable to construction and installation of electrical conductors and cable. Comply with UL standards and provide electrical conductors and cables that have been UL-listed and labeled.
 - B. Comply with applicable portions of NEMA/Insulated Cable Engineers Association standards pertaining to materials, construction and testing of conductors and cable.
 - C. Comply with applicable portions of ANSI/ASTM and IEEE standards pertaining to construction of conductors and cable.
- 1.5 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS

- 2.1 COPPER [AND ALUMINUM] CONDUCTORS (600V):
 - A. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:
 - 1. Distribution and Panelboard Feeders; and Other Conductors, #2 AWG and Larger [Aluminum] conductor; see drawings for insulation type.
 - 2. Branch Circuit Conductors and All Conductors #3 AWG and Smaller Copper conductor, with THHN/THWN insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG. Provide solid conductors for #10 AWG and smaller. Provide stranded conductors for #8 AWG and larger.

- 3. Aluminum Conductors. Where aluminum conductors are specified for use, provide compact stranded Aluminum Association 8000- series alloy conductor material.
 - a. <u>Stabiloy Alcan Cable</u>
 - b. <u>Triple E Southwire</u>
- B. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
- C. Provide neutral and ground wire as specified elsewhere in documents.
- D. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.

PART 3 - EXECUTION

- 3.1 INSTALLATION:
 - A. General: Install electric conductors and cables as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in accordance with recognized industry practices.
 - B. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.
 - C. Cables may be pulled by direct attachment to conductors or by use of basket weave pulling grip applied over cables. Attachment to pulling device shall be made through approved swivel connection. Nonmetallic jacketed cables of small size may be pulled directly by conductors by forming them into a loop that pull wires can be attached; remove insulation from conductors before forming the loop. Larger sizes of cable may be pulled by using basket weave pulling grip, provided the pulling force does not exceed limits recommended by manufacturer; if pulling more than one cable, bind them together with friction tape before applying the grip. For long pulls requiring heavy pulling force, use pulling eyes attached to conductors.
 - D. Do not exceed manufacturer's recommendations for maximum allowable pulling tension, side wall pressure, and minimum allowable bending radius. In all cases, pulling tension applied to the conductors shall be limited to 0.008 lbs. per circular mil of conductor cross-section area.
 - E. Pull in cable from the end having the sharpest bend; i.e. bend shall be closest to reel. Keep pulling tension to minimum by liberal use of lubricant, and turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one in pullhole during this operation.
 - F. For training of cables, minimum bend radius to inner surface of cable shall be 12 times cable diameter.
 - G. Where cable is pulled under tension over sheaves, conduit bends, or other curved surfaces, make minimum bend radius 50% greater than specified above for training.
 - H. Use only wire and cable pulling compound recommended by the specific cable manufacturer, and that is listed by UL.
 - I. Seal all cable ends unless splicing is to be done immediately. Conduit bodies shall not contain splices.
 - J. Support all cables in pullholes, concrete trenches, and similar locations by cable racks and secure to rack insulators with nylon cord or self-locking nylon cable ties. Place each cable on separate insulator. In manholes, pullholes, concrete trenches, and similar locations,

wrap strips of fire-proofing tape (approx. 1/16 inch thick by 3 inches wide) tightly around each cable spirally in half-lapped wrapping or in two butt-joined wrappings with the second wrapping covering the joints in the first. Apply tape with the coated side toward the cable, and extend tape one inch into the ducts. To prevent unraveling, random wrap the fireproofing tape the entire length of the fireproofing with pressure sensitive glass cloth tape. Provide fireproofing tape of a flexible, conformable fabric having one side coated with flame retardant, flexible, polymeric coating and/or a chlorinated elastomer not less than 0.050 inch thick weighing not less than 2.5 pounds per square yard. Provide tape that is noncorrosive to cable sheath, self-extinguishing, and that will not support combustion. Construct tape of materials that do not deteriorate when subjected to oil, water, gases, salt water, sewage and fungus.

- K. Follow manufacturer's instructions for splicing and cable terminations.
- 3.2 AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW:
 - A. Prior to energization, test cable and wire for continuity of circuitry, and for short circuits, Megger all circuits of 100 amp and greater rating. Correct malfunctions. Record all test data and provide written test report.
 - B. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements.
- 3.3 IDENTIFICATION OF FEEDERS: Refer to Section 26 0553 for requirements.

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PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to supports, anchors, sleeves, and seals, specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of supports, anchors, and sleeves is indicated by drawings and schedules and/or specified in other Division-26 sections. See Section 260532, Raceways, for additional requirements.
- B. Work of this section includes supports, anchors, sleeves and seals required for a complete raceway support system, including but not limited to: clevis hangers, riser clamps, C-clamps, beam clamps, one and two hole conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, threaded rods and all associated accessories.

1.3 QUALITY ASSURANCE:

A. Comply with NEC as applicable to construction and installation of electrical supporting devices. Comply with applicable requirements of ANSI/NEMA Std. Pub No. FB 1, "Fittings and Supports for Conduit and Cable Assemblies". Provide electrical components that are UL-listed and labeled.

PART 2 - PRODUCTS

- 2.1 MANUFACTURED SUPPORTING DEVICES:
 - A. GENERAL:
 - 1. Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. See drawings for additional requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES:

- A. Install hangers, anchors, sleeves, and seals as required, in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structures. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. For pre-and post tensioned construction, use pre-set inserts for support of all electrical work. Do not use toggle bolts, moly bolts, wood plugs or screws in sheetrock or plaster as support for any equipment or raceway.
- D. RACEWAYS:

Support raceways that are rigidly attached to structure at intervals not to exceed 8 feet on center, minimum of two straps per 10 foot length of raceway, and within 12" of each junction box, coupling, outlet or fitting. Support raceway at each 90° degree bend. Support raceway (as it is installed) in accordance with the following:

NUMBER OF RUNS	<u>3/4" TO 1-1/4" 0</u>	<u>1-1/2" & LARGER 0</u>
1	Full straps, clamps or hangers.	Hanger
2	Full straps, clamps or hangers.	Mounting Channel
3 or more	Mounting Channel	Mounting Channel

2. Support suspended raceways on trapeze hanger systems; or individually by means of threaded rod and straps, clamps, or hangers suitable for the application. Do not use independent support wires as a portion of any raceway support system; do not support raceway from ceiling support wires.

E. FLOOR MOUNTED EQUIPMENT:

- 1. Provide rigid attachment of all floor mounted equipment to the floor slab or structural system. Provide 5/8" bolts or expansion anchors at each 90 degree corner and at intervals not to exceed 48" on center along entire perimeter of the equipment. Provide rigid attachment for all floor mounted switchboards, panelboards, power and control equipment, motor control centers, dimmer cabinets, transformers (provide neoprene vibrations isolators at anchor points), oil switches, battery packs and racks, and similar equipment furnished under Division 26, 27 and 28.
- F. WIREWAYS, BUS DUCTS AND CABLE TRAYS:
 - 1. Provide vertical and lateral support systems for all wireways, busway, and cable trays that are supported from overhead structure. See Sections 260536 and 262500 for additional requirements.

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to electrical raceways and specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of raceways is indicated by drawings and schedules.
- B. Types of raceways in this section include the following:
 - 1. Electrical Metallic Tubing
 - 2. Flexible Metal Conduit
 - 3. Intermediate Metal Conduit
 - 4. Liquid-tight Flexible Metal Conduit
 - 5. Rigid Metal Conduit
 - 6. Rigid Non-metallic Conduit
- 1.3 QUALITY ASSURANCE:
 - A. MANUFACTURERS: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.
 - B. STANDARDS: Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components that have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.
 - C. SUBMITTALS: Refer to Section 26 0502 for requirements.
- PART 2 PRODUCTS
- 2.1 METAL CONDUIT AND TUBING:
 - A. GENERAL:
 - 1. Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4".
 - B. RIGID METAL CONDUIT (RMC): FS WW-C-0581 and ANSI C80.1.
 - C. INTERMEDIATE STEEL CONDUIT (IMC): FS WW-C-581.
 - D. PVC EXTERNALLY COATED RIGID STEEL CONDUIT: ANSI C80.1 and NEMA Std. Pub. No. RN 1.
 - E. ALUMINUM CONDUIT: Not acceptable.
 - F. MC CABLE: Only acceptable as indicated below.
 - 1. MC Cable is acceptable for all branch circuits installed in gypsum wallboard walls from the home run device box to the last device box on the branch circuit and all boxes in between, from the home run device box to the branch panel, the circuit

shall be installed in an approved raceway. All MC Cable shall be provided with anti-short fittings.

- 2. MC Cable is acceptable for all light fixture whips not longer than six feet in length. Located in removable grid ceilings. MC Cable is unacceptable to be installed from light fixture to light fixture. All MC Cable shall be provided with anti-short fittings.
 - a. The use of MC-PCS cable is acceptable for light fixture whips utilizing 0-10v control schemes, not longer than 72" in length, located above removable grid ceilings. All MC cable shall be provided with anti-short fittings.
 - Acceptable Manufacturers
 - 1. AFC MC Luminary Cable
 - 2. Encore MC-LED Lighting Cable
 - 3. Southwire MC-PCS Duo
- 3. Before any rough-in of MC cable, the contractor shall conduct a on-site meeting with owner and engineer to review standards and overall rough-in requirements. Contractor shall conform to all owner and engineer requirements.
- 4. Contractor mock-up one classroom for review of electrical installation prior to continuing installation of MC cabling.
- G. RIGID AND INTERMEDIATE STEEL CONDUIT FITTINGS:

i.

- 1. Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide double locknuts and metal bushings at all conduit terminations. Install OZ Type B bushings on conduits 1-1/4" and larger.
- H. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.
- I. EMT FITTINGS:
 - 1. Provide insulated throat nylon bushings with non-indenter type malleable steel fittings at all conduit terminations. Install OZ Type B bushings on conduits 1" larger. Cast or indenter type fittings are not acceptable.
- J. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type;
 - 1. Zinc-coated steel.
- K. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 1, and Style A.
- L. LIQUID TIGHT FLEXIBLE METAL CONDUIT:
 - 1. Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).
- M. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3, Style G.
- N. EXPANSION FITTINGS: OZ Type AX, or equivalent to suit application.
- 2.2 NON-METALLIC CONDUIT AND DUCTS:
 - A. GENERAL:
 - 1. Provide non-metallic conduit, ducts and fittings of types, sizes and weights as indicated; with minimum trade size of 3/4".
 - B. UNDERGROUND PVC PLASTIC UTILITIES DUCT:
 - 1. Minimum requirements shall be schedule 40 for encased burial in concrete and for Type II for direct burial.
 - C. PVC AND ABS PLASTIC UTILITIES DUCT FITTINGS:

- D. ANSI/NEMA TC 9, match to duct type and material.
- E. HDPE CONDUIT: Not acceptable.
- 2.3 CONDUIT; TUBING; AND DUCT ACCESSORIES:
 - A. Provide conduit, tubing and duct accessories of types and sizes, and materials, complying with manufacturer's published product information, that mate and match conduit and tubing. Provide manufactured spacers in all duct bank runs.
- 2.4 SEALING BUSHINGS:
 - A. Provide OZ Type FSK, WSK, or CSMI as required by application. Provide OZ type CSB internal sealing bushings.
- 2.5 CABLE SUPPORTS:
 - A. Provide OZ cable supports for vertical risers, type as required by application.
- PART 3 EXECUTION
- 3.1 INSTALLATION OF ELECTRICAL RACEWAYS:
 - A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following:
 - 1. FEEDERS UNDER 600 VOLTS:
 - a. Install feeders to panels and motor control centers and individual equipment feeders rated 100 amps and greater, in rigid metal conduit (RMC), or intermediate metal conduit (IMC), or Electrical Metallic Tubing (EMT); except where buried below grade, install in non-metallic conduit or duct. Encase feeders 1-1/4" and larger, individually in concrete where installed below grade. See duct banks.
 - 2. BRANCH CIRCUITS, SIGNAL AND CONTROL CIRCUITS, AND INDIVIDUAL EQUIPMENT CIRCUITS RATED LESS THAN 100 AMPS:
 - a. Install in electric metallic tubing (EMT). Below concrete slab-on-grade or in earth fill, install in non-metallic plastic duct. In areas exposed to weather, moisture, or physical damage, install in RMC or IMC. In suspended slabs, install in PVC. Encase non-metallic duct 40-amp circuits, 1-1/4" and larger in concrete. See duct banks.
 - B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
 - C. Install raceway in accordance with the following:
 - Provide a minimum of 12" clearance measured from outside of insulation from flues, steam and hot water piping, etc. Avoid installing raceways in immediate vicinity of boilers and similar heat emitting equipment. Conceal raceways in finished walls, ceilings and floor (other than slab-on-grade), except in mechanical, electrical and/or communication rooms, conceal all conduit and connections to motors, equipment, and surface mounted cabinets unless exposed work is indicated on the drawings. Run concealed conduits in as direct a line as possible with gradual bends. Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines. Do not install lighting raceway until piping and duct work locations have been determined in order to avoid fixtures being obstructed by overhead equipment.
 - 2. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway. Paint all field threads (or portions of

raceway where corrosion protection has been damaged) with primer and enamel finish coat to match adjacent raceway surface.

- 3. Provide a minimum of 1 ¹/₂" from nearest surface of the roof decking to raceway.
- 4. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
- 5. Provide neutral and ground wire as specified elsewhere in documents.
- 6. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.
- D. Comply with NEC for requirements for installation of pull boxes in long runs.
- E. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandrel and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.
- F. Replace all crushed, wrinkled or deformed raceway before installing conductors.
- G. Do not use flame type devices as a heat application to bend PVC conduit. Use a heating device that supplies uniform heat over the entire area without scorching the conduit.
- H. Provide rigid metal conduit (RMC) for all bends greater than 22 degrees in buried conduit. Provide protective coating for RMC bend as specified herein.
- I. Where raceways penetrate building, area ways, manholes or vault walls and floors below grade, install rigid metal conduit (RMC) for a minimum distance of 10 feet on the exterior side of the floor or wall measured from interior face. Provide OZ, Type FSK, WSK or CSMI sealing bushings (with external membrane clamps as applicable) for all conduit penetrations entering walls or slabs below grade. Provide segmented type CSB internal sealing bushings in all raceways penetrating building walls and slabs below grade, and in all above grade raceway penetrations susceptible to moisture migration into building through raceway.
- J. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.
- K. Install spare 3/4" conduits (capped) from each branch panelboard into the ceiling and floor space. Run five into the ceiling space and five into the floor space. Where the floor is not accessible run six conduits into the ceiling space. Run conduits the required distance necessary to reach accessible ceiling space.
- L. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.
- M. Provide OZ cable supports in all vertical risers in accordance with NEC 300-19; type as required by application.
- N. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.
- O. Raceway installation below grade:
 - 1. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
 - 2. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.

- P. Raceway installation below slab-on-grade, or below grade:
 - For slab-on-grade construction, install runs of rigid plastic conduit (PVC) below slab. All raceway shall be located a minimum of 8" below bottom of slab. Install RMC (with protective coating) for raceways passing vertically through slab-ongrade. Slope raceways as required to drain away from electrical enclosures and to avoid collection of moisture in raceway low points.
 - 2. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
 - 3. Mark all buried conduits that do not require concrete encasement by placing yellow plastic marker tape (minimum 6" wide) along entire length of run 12" below final grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker.
 - 4. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.
- Q. MC CABLE:
 - 1. MC Cable shall be supported and secured as follows:
 - a. Cables shall be supported at intervals not exceeding 6 feet.
 - b. Cables shall be secured with 12 inches of every box, cabinet, fitting or other cable termination.
- R. Raceway installation in suspended slabs:
 - 1. Install conduit as close to the middle of concrete slab as practicable without disturbing reinforcement. Do not install conduits of diameter greater than 1/3 of the slab thickness. Space conduits not less than 3 diameters on center (except at stub up locations). Provide OZ expansion fittings at all expansion joints. All raceways shall be installed with concrete tight fittings. Include copper ground conductor in all raceways installed in suspended slabs.
- S. Raceway installation in hazardous locations:
 - 1. Install RMC in all hazardous locations as defined by NEC. Provide suitable fittings, seal-offs, boxes, etc. to comply with requirements.
 - 2. Engage at least five full threads on all fittings. Provide inspection fittings with explosion proof drains to prevent water accumulation in conduit runs. Install seal-offs for arcing or high temperature equipment, at housing with splices or taps and where conduits enter or leave the hazardous area. Provide seal-offs of the appropriate type for vertical or horizontal installation. Ground all metallic parts.
- T. Electrical Identification: Refer to Section 260553 for requirements.
- U. SPARE PARTS: Refer to Section 26 0502 for requirements.
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1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to electrical wiring boxes and fittings specified herein. See Section 260532, Raceways, for additional requirements.

1.2 DESCRIPTION OF WORK:

- A. The extent of electrical box and electrical fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings in this section include the following:
 - 1. Outlet Boxes
 - 2. Junction Boxes
 - 3. Pull Boxes
 - 4. Conduit Bodies
 - 5. Bushings
 - 6. Locknuts
 - 7. Knockout Closures
 - 8. Miscellaneous Boxes and Fittings
- 1.3 QUALITY ASSURANCE:
 - A. Comply with NEC as applicable to construction and installation of electrical boxes and fittings. Comply with ANSI C 134,1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports. Provide electrical boxes and fittings that have been UL-listed and labeled.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS

- 2.1 FABRICATED MATERIALS:
 - A. INTERIOR OUTLET BOXES:
 - 1. Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes with accessory rings, of types, shapes and sizes, including box depths, to suit each respective location and installation, construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box and covers and wiring devices; minimum size 4"x4"x2-1/8".
 - 2. Provide an 'FS' box, with no knockouts when surface mounted in a finished, nonutility space. Surface mounting is only acceptable when approved by the Architect.
 - B. INTERIOR OUTLET BOX ACCESSORIES:
 - 1. Provide outlet box accessories as required for each installation, including mounting brackets, hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, that are compatible with outlet boxes being used and fulfilling requirements of individual wiring applications.
 - C. WEATHERPROOF OUTLET BOXES:

- 1. Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes (including depth) required, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, with face plate gaskets and corrosion-resistant fasteners.
- D. JUNCTION AND PULL BOXES:
 - 1. Provide code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- E. CONDUIT BODIES:
 - 1. Provide galvanized cast-metal conduit bodies, of types, shapes and sizes to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- F. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS:
 - 1. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable steel conduit bushings and offset connectors, of types and sizes to suit respective uses and installation.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

- A. GENERAL:
 - 1. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
 - 2. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
 - 3. Provide coverplates for all boxes. See Section 262726, Wiring Devices.
 - 4. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
 - 5. Provide knockout closures to cap unused knockout holes where blanks have been removed.
 - 6. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Do not install boxes above ducts or behind equipment. Install recessed boxes with face of box or ring flush with adjacent surface. Seal between switch, receptacle and other outlet box openings and adjacent surfaces with plaster, grout, or similar suitable material.
 - 7. Fasten boxes rigidly to substrates or structural surfaces, or solidly embed electrical boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10" of conduit between them. Set boxes on opposite sides of fire resistant walls with minimum of 24" separation.
 - 8. Provide a minimum of $1 \frac{1}{2}$ " from the nearest surface of the roof decking to the installed boxes.
 - 9. Provide electrical connections for installed boxes.

- 1.1 WORK INCLUDED:
 - A. Anchorage and seismic restraint systems for all Division 26 isolated and non-isolated equipment, cable tray, and conduit systems.
 - B. Anchorage and seismic restrain systems for electrical components shall include but not be limited to the following:
 - 1. Pad Mounted Equipment
 - 2. Conduit
 - 3. Cable Tray
 - 4. Bus Duct
 - 5. Light Fixtures
- 1.2 RELATED WORK:
 - A. Requirements: Provide Electrical Seismic Control in accordance with the Contract Documents.
 - B. Section 260500 Electrical General Provisions
- 1.3 REFERENCES:
 - A. International Building Code, Current Edition in use by Jurisdictional Authority.
 - B. NFPA Bulletin 90A, Current Edition.
 - C. UL Standard 181.
 - D. ASCE 7-10
- 1.4 SYSTEM DESCRIPTION
 - A. The Division 26 Contractor shall be responsible for supplying and installing equipment, vibration isolators, flexible connections, rigid steel frames, anchors, inserts, hangers and attachments, supports, seismic snubbers and bracing to comply with the following:
 - 1. Short period design spectral response acceleration coefficient SDS=0.70.
 - 2. One second period design spectral response acceleration coefficient SD1=0.28.
 - 3. Site Class B.
 - 4. Seismic Design Category D.
 - B. Seismic Restraint Exceptions
 - 1. The following components are exempt from the requirements of this section
- 1.5 QUALITY ASSURANCE:
 - A. All supports, hangers, bases, anchorage and bracing for all isolated equipment and nonisolated equipment shall be designed by a professional engineer licensed in the state where the project is located, employed by the restraint manufacturer, qualified with seismic experience in bracing for electrical equipment. Shop drawings submitted for earthquake bracing and anchors shall bear the Engineer's signed professional seal. All calculations/design work required for the seismic anchorage and restraint of all Division 26 equipment and systems shall be provided by a single firm.
 - B. The above qualified seismic engineer shall determine specific requirements for equipment anchorage and restraints, locations and sizes based on shop drawings for the electrical equipment that have been submitted, reviewed and accepted by the Architect/Engineer for this project.

- C. Seismic Engineer or the Engineer's Representative shall field inspect final installation and certify that bracing and anchorage are in conformance with the Seismic Engineer's design. A certificate of compliance bearing the Seismic Engineer's signed Professional Engineer's seal shall be submitted and shall be included in each copy of the Operation and Maintenance Manuals.
- D. The Division 26 Contractor shall require all equipment suppliers furnish equipment that meets the seismic code, with bases/skids/curb designed to receive seismic bracing and/or anchorage. All isolated and non-isolated electrical equipment bracing to be used in the project shall be designed from the Equipment Shop Drawings and certified correct by the equipment manufacturer for seismic description listed in Paragraph 1.4 above, with direct anchorage capability.
- 1.6 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS:

2.1 RESTRAINT EQUIPMENT AND SYSTEMS:

- A. Acceptable Manufacturers and Suppliers for Non-Isolated Systems:
 - 1. Mason Industries, Inc.
 - 2. Korfund
 - 3. Amber/Booth Company
 - 4. Vibration Mountings and Control Company
 - 5. Kinetics
 - 6. International Seismic Application Technology
 - 7. Tolco
- B. Manufacture and design of restraints and anchors for isolated equipment shall be by the manufacturer of the vibration isolators furnished for the equipment.
- 2.2 SNUBBERS:
 - A. Snubbers shall be all-directional and consist of interlocking steel members restrained by replaceable shock absorbent elastomeric materials a minimum of 3/4 inch thick.
 - B. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch or more than 1/4 inch.
 - C. Snubbers shall be Mason Industries Z -1011 or accepted equivalent.

PART 3 – EXECUTION

3.1 DESIGN AND INSTALLATION:

- A. General:
 - 1. All electrical components shall be braced, anchored, snubbed or supported to withstand seismic disturbances in accordance with the criteria of this specification. Provide all engineering, labor, materials, and equipment for protection against seismic disturbances as specified herein. The following electrical components are exempt from seismic restraint requirements.
 - a. Electrical components in Seismic Design Category A or B (see section 1.4)
 - b. Electrical components in Seismic Design Category C provided that the component importance factor, I_p , is equal to 1.0 (see section 1.4).
 - c. Electrical components in Seismic Design Categories D, E, or F where all of the following apply:

- i. The component importance factor, I_p , is equal to 1.0;
- ii. The component is positively attached to the structure;
- iii. Flexible connections are provided between the component and associated ductwork, piping, and conduit; and either
 - The component weighs 400 lb (1,780 N) or less and has a center of mass located 4 ft (1.22 m) or less above the adjacent floor level; or
 - The component weighs 20 lb (89 N) or less or, in the case of a distributed system, 5 lb/ft (73 N/m) or less.
- 2. Powder-actuated fasteners (shot pins) shall not be used for component anchorage in tension applications in Seismic Design Category D, E, or F.
- 3. Attachments and supports for electrical equipment shall meet the following provisions:
 - a. Attachments and supports transferring seismic loads shall be constructed of materials suitable for the application and designed and constructed in accordance with a nationally recognized structural code such as, when constructed of steel, AISC, Manual of Steel Construction (Ref. 9.8-1 or 9.8-2).
 - b. Friction clips shall not be used for anchorage attachment.
 - c. Expansion anchors shall not be used for electrical equipment rated over 10 hp (7.45 kW). Exception: Undercut expansion anchors.
 - d. Drilled and grouted-in-place anchors for tensile load applications shall use either expansive cement or expansive epoxy grout.
 - e. Supports shall be specifically evaluated if weak-axis bending of lightgauge support steel is relied on for the seismic load path.
 - f. Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as 2Fp. The intent is to prevent excessive movement and to avoid fracture of support springs and any non- ductile components of the isolators.
 - g. Seismic supports shall be constructed so that support engagement is maintained.
- B. Pad Mounted Equipment
 - 1. Spring Isolated Equipment:
 - a. All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases as described in the vibration control specifications unless the equipment manufacturer certified direct attachment capability. Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. Snubbers shall be installed with factory set clearances.
 - 2. Non-Isolated Equipment:
 - a. The section 260548 (Electrical Seismic Control) Contractor shall be responsible for thoroughly reviewing all drawings and specifications to

determine all equipment i.e. switchboards, transformers, generators, etc. to be restrained. This Contractor shall be responsible for certifying that this equipment is mounted and braced such that it adheres to the system description criteria in part 1.4 of this specification section.

- C. Conduit, Conduit Racks/Trapeze Assemblies, Cable Tray and Bus Duct:
 - 1. Seismic braces for be omitted when the distance from the supporting structure to the raceway support point is 12" or less. Where rod hangers are used, they shall be equipped with swivels to prevent inelastic bending in the rod.
 - 2. Seismic braces may be omitted where the total weight of the assembly is less than 10 lb/ft.
 - 3. Seismic braces for individual conduit may be omitted for conduit less than 2.5 inch trade size.
 - 4. A rigid conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: Wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.
 - 5. Unbraced conduit attached to in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.
 - 6. At the interface of adjacent structures or portions of the same structure that may move independently, utility lines shall be provided with adequate flexibility to accommodate the anticipated differential movement between the ground and the structure.
 - 7. Provide large enough pipe sleeves through wall or floors to allow for anticipated differential movements.
 - 8. For spaces, where the Importance Factor (Ip) is equal to 1.5, all electrical components that are attached to structures that could displace relative to one another and for isolated structures where components cross the isolation interface, the components shall be designed to accommodate the eismic relative dispalcements.
- D. Light Fixtures
 - 1. Light fixtures, lighted signs, and ceiling fans not connected to ducts or piping, which are supported by chains or otherwise suspended from the structure, are not required to satisfy the seismic force and relative displacement requirements provided they meet all of the following criteria:
 - a. The design load for such items shall be equal to 1.4 times the operating weight acting down with a simultaneous horizontal load equal to 1.4 times the operating weight. The horizontal load shall be applied in the direction that results in the most critical loading for the design.
 - b. Seismic interaction effects shall not cause an effect so that the failure of the non-essential component causes a failure of an essential component.
 - c. The connection to the structure shall allow a 360° range of motion in the horizontal plane.
 - d. The component is less than 20 lbs and has flexible connections and an importance factor (Ip) equal to 0.

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS:
 - A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
 - B. Requirements of the following Division 26 Sections apply to this section:
 - 1. "Basic Electrical Requirements".
 - 2. "Basic Electrical Materials and Methods".

1.2 SUMMARY

- A. This section includes identification of electrical materials, equipment and installations. It includes requirements for electrical identification components including but not limited to the following:
 - 1. Buried electrical line warnings.
 - 2. Identification labels for raceways, cables and conductors.
 - 3. Operational instruction signs.
 - 4. Warning and caution signs.
 - 5. Equipment labels and signs.
 - 6. Arc-flash hazard labels
- B. Related Sections: The following sections contain requirements that relate to this section:
- C. Division 9 Section "Painting" for related identification requirements.
- D. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code"
- 1.4 SUBMITTALS: Refer to Section 26 0503 for requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. American Labelmark Co.
 - 2. Calpico, Inc.
 - 3. Cole-Flex Corp.
 - 4. Emed Co., Inc.
 - 5. George-Ingraham Corp.
 - 6. Ideal Industries, Inc.
 - 7. Kraftbilt
 - 8. LEM Products, Inc.

- 9. Markal Corp
- 10. National Band and Tag Co.
- 11. Panduit Corp.
- 12. Radar Engineers Div., EPIC Corp.
- 13. Seton Name Plate Co.
- 14. Standard Signs, Inc.
- 15. W.H Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Conduit Systems for raceway identification:
 - 1. Factory-painted conduit and/or factory-painted couplings and fittings
- B. Colored paint for raceway identification:
 - 1. Use <u>Kwal Paint</u> colors as specified in Part 3 Execution.
- C. Color Adhesive Marking Tape for Raceways, Wires and Cables:
 - 1. Self-adhesive vinyl tape not less than 3 mills thick by 1" to 2" in width.
- D. Underground Line Detectable Marking Tape:
 - 1. Permanent, bright colored, continuous-printed, acid- and alkali-resistant plastic tape specifically compounded for direct-burial service. Not less than 6" wide by 4 mills thick.
 - 2. With metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.
 - 3. Printed legend indicative of general type of underground line below.
- E. Wire/Cable Designation Tape Markers:
 - 1. Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letters.
- F. Brass or Aluminum Tags:
 - 1. Metal tags with stamped legend, punched for fastener.
 - 2. Dimensions: 2" X 2" 19 gage.
- G. Engraved, Plastic Laminated Labels, Signs and Instruction Plates:
 - 1. Engraving stock plastic laminate, 1/16" minimum thickness for signs up to 20 sq. in. or 8" in length; 1/8 " thick for larger sizes. Engraved legend in 1/4" high white letters on black face and punched for mechanical fasteners.
- H. Arc-flash Hazard Labels:
 - 1. ANSI Z535.4 Safety Label.
 - 2. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.
 - 3. Dimensions: 5" x 3.5"
 - 4. Information contained: Arc-flash boundary; Voltage; Flash Hazard Category; Incident Energy (arc rating); checkboxes for the required Personal Protective Equipment (PPE) and the date that the calculations were performed.
- I. Equipment Labels:
 - 1. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.

- 2. Dimensions: minimum 5" x 2"
- 3. Conductor-Identification-Means Labels:
 - a. Information contained: the method utilized for identifying ungrounded conductors within switchboards, distribution panels and branch circuit panels.
- 4. Available-Fault-Current Labels:
 - a. Information contained: maximum available fault current at the respective piece of equipment, and date of calculation of fault current.
- 5. Source-of-Supply Labels:
 - a. Information contained: indicate the device or equipment where the power supply originates.
- J. Baked Enamel Warning and Caution Signs for Interior Use:
 - 1. Preprinted aluminum signs, punched for fasteners, with colors legend and size appropriate to location.
- K. Fasteners for Plastic-Laminated and Metal Signs:
 - 1. Self-tapping stainless steel screws or # 10/32 stainless steel machine screws with nuts, flat and lock washers.
- L. Cable Ties:
 - 1. Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18" minimum width, 50-lb. Minimum tensile strength, and suitable for a temperature range from minus 40° F. to 185° F. Provide ties for specified colors when used for color coding.
- M. Colored Support Wires:
 - 1. When electrical equipment/wiring is supported by wires within the ceiling cavity, these wires shall be independent of the ceiling support assembly and shall be distinguishable by painting entire length in bright yellow.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lettering and Graphics:
 - 1. Coordinate names, abbreviations, colors and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering and colors as approved in submittals and as required by code.
- B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- C. Sequence of Work:
 - 1. Where identification is to be applied to surfaces that require a finish, install identification after completion of finish work.
- D. Conduit Identification:
 - 1. Identify Raceways of Certain Systems with Color Coding. Acceptable means of color identification are as follows:
 - a. Factory-painted conduit.
 - b. Band exposed or accessible raceways of the following systems for identification. Bands shall be pre-tensioned, snap-around colored plastic

sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-root maximum intervals in straight runs. Apply the following colors:

- i. Fire Alarm System: Red
- ii. Sound/IC: Yellow
- iii. Data: Blue
- iv. MATV: Black
- v. Security: Orange
- vi. Legally Required Emergency Systems: Red with Black Stripe (Per NEC 700.10(A))
- 2. Identify Junction, Pull and Connection Boxes.
 - a. Code-required caution sign for boxes shall be pressured-sensitive, selfadhesive label indication system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers on outside of cover with identity of contained circuits. Use pressuresensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

<u>SYSTEM</u>	COLOR (ALL COLORS ARE KWAL PAINT)	
Fire Alarm	Red Alert	AC118R
Sound/IC	Competition Yellow	7225A
Security	Fiesta Orange	AC107Y
Data	Neon Blue	7076A
MATV	Flat Black	
Legally Required EM System	Red/Black Stripe	

3. Label and paint the covers of the systems junction boxes as follows:

- E. Underground Electrical Line Identification.
 - 1. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground line detectable marking tape, located directly above line at 6 to 8 inches below finished grade. Where multiple lines are installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
 - 2. Install detectable marking tape for all underground wiring, both direct-buried and in raceway.
 - 3. Provide red marker dye applied to concrete encased ductbank.
- F. Conductor Color Coding.
 - 1. Provide color coding for secondary service, feeder and branch circuit conductors throughout the project secondary electrical system as follows:

CONDUCTOR	208Y / 120V System	<u>480Y / 277V System</u>
Phase A	Black	Brown

Phase B	Red	Orange	
Phase C	Blue	Yellow	
Shared/Single Neutral	White	Gray	
Neutral A (dedicated)	White w/Black Stripe	Gray w/Black Stripe	
Neutral B (dedicated)	White w/Red Stripe	Gray w/Orange Stipe	
Neutral C (dedicated)	White w/Blue Stripe	Gray w/Yellow Stipe	
Equipment Ground	Green	Green	
Isolated Ground	Green w/Yellow Strip	Green w/Yellow Stripe	

- 2. Switch legs, travelers and other wiring for branch circuits shall be of colors other than those listed above.
- 3. Use conductors with color factory applied the entire length of the conductors except as follows:
 - a. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
 - b. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
 - c. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- G. Power Circuit Identification.
 - 1. Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb monofilament line or one-piece self-locking nylon cable ties.
 - 2. Tag or label conductors as follows:
 - a. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicting source and circuit numbers.
 - b. Multiple Circuits: Where multiple branch circuits or control wiring or communications/ signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

- 3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- H. Apply warning, caution and instruction signs and stencils as follows:
 - 1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items. Warning and caution signs shall be furnished and installed on, but not be limited to the following equipment and locations:
 - a. Entrances to rooms and other guarded locations that contain exposed live parts 600 volts or less; signs shall forbid unqualified personnel to enter.
 - b. Switch and Overcurrent device enclosures with splices, taps and feedthrough conductors. Provide warning label on the enclosures that identifies the nearest disconnecting means for any feed-through conductors.
 - c. Entrances to buildings, vaults, rooms or enclosures containing exposed live parts or exposed conductors operating at over 600 volts: DANGER-HIGH VOLTAGE-KEEP OUT.
 - d. Metal-enclosed switchgear, unit substations, transformers, enclosures, pull boxes, connection boxes and similar equipment operating at over 600 volts shall have appropriate caution signs and warning labels.
 - e. Indoor and Outdoor substations operating over 600 volts. Provide warning signs, instructional signs and single-line diagrams in accordance with NEC 225.70.
- I. Emergency Operating Signs: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.
- J. Install equipment/system circuit/device identification as follows:
 - 1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/4"-high lettering on 1-inch-high label (1 1/2-inch-high where two lines are required) white lettering in black field. White lettering in red field for Emergency Power Systems. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.
 - a. Each service disconnect, to identify it as a service disconnect.
 - b. Panelboards (exterior and interior), electrical cabinets, and enclosures. For subpanels, identify feeder circuit served from.
 - c. Switches in fusible panelboards shall be labeled. Main switches shall be identified.
 - d. Access doors and panels for concealed electrical items.
 - e. Electrical switchgear and switchboards.
 - f. Motor control centers.

- g. Motor starters, including circuit origination, HP, heater size, FLA, and mechanical equipment designation.
- h. Disconnect switches.
- i. Pushbutton stations.
- j. Power transfer equipment.
- k. Contactors.
- I. Dimmers.
- m. Control devices.
- n. Transformers.
- o. Power generating units, to include transfer switches.
- p. Telephone switching equipment.
- q. Clock/program master equipment.
- r. Call system master station.
- s. TV/audio monitoring master station.
- t. Fire alarm master station or control panel.
- u. Busduct Label all cable tap boxes, bus plug-in units, etc. with plastic laminate labels designating load served.
- v. Variable frequency drives.
- w. Lighting Control Equipment.
- x. Uninterruptable Power Supply.
- K. Post Conductor-Identification-Means labels at locations of switchboards, distribution panels and branch circuit panels. The labels shall identify the color-coding used on ungrounded conductors for each voltage system used on the premises.
- L. Apply Available-Fault-Current labels at the service entrance equipment.
- M. Apply Source-of-Supply labels on the exterior covers of equipment (except in single- or two-family dwellings) as follows:
 - 1. Each switchboard supplied by a feeder.
 - 2. Each branch circuit panelboard supplied by a feeder.
 - 3. Each disconnect switch serving elevators, escalators, moving walks, chairlifts, platform lifts and dumbwaiters.
 - 4. Each dry type transformer (or primary-side disconnect switch at transformer). If the primary-side disconnect is remote from the transformer, both the remote disconnect and the transformer shall be labeled, and the transformer label shall also indicate the location of the disconnect.
 - 5. Each feeder disconnect, branch circuit disconnect, panelboard or switchboard in a remote building or structure.
 - 6. Each on-site emergency power source, with sign placed at service entrance equipment to comply with NEC 700.
- N. The label shall identify the device or equipment where the power supply originates, and the system voltage, phase or line and system at all termination, connection and splice points. For example: Feeder Power Supply for Panel "XX" Originates at Panel "XX" (or Switchboard "XX", Transformer "XX", Switch "XX", etc.); 120/208 volts, 3-phase, Phase Color Identification (or 120/240, 277/480, etc.).
- O. Install Arc-flash hazard labels on the following equipment:
 - 1. Each piece of service entrance equipment.

- 2. Each power distribution switchboard or panel.
- 3. Each individually mounted circuit breaker.
- 4. Each branch circuit panelboard.
- 5. Each motor control center.
- 6. Each individually mounted motor starter.
- 7. Each meter socket enclosure.
- P. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere.
- Q. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- R. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics: Example; "208V 30A".
- S. Mark each device box (for each type of wiring device) with a permanent ink felt tip marker, indicating the circuit that the device is connected to: Example; "CKT A-1"
- T. Label circuit breaker feeding fire alarm panel "Fire Alarm Circuit". Using plastic laminate label, white lettering on a red background.

SECTION 260923 - OCCUPANCY SENSORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. The extent of occupancy sensor work is indicated by drawings and schedules.
- B. Types of occupancy sensors in this section include the following:
 - 1. Dual Technology Wall Switch
 - 2. Dual Technology Wall Switch with Dimming and Daylight Control.
 - 3. Dual Technology Ceiling Sensor w/ Control Pack

1.3 QUALITY ASSURANCE:

- A. Comply with NEC and NEMA standards as applicable to construction and installation of occupancy sensors. Provide occupancy sensors that have been UL listed and labeled.
- B. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems, motor loads and any other passive infrared or microwave systems.

1.4 SUBMITTALS:

A. Refer to Section 26 0502 for electrical submittal requirements.

PART 2 - PRODUCTS

- 2.1 MANUFACTURER: The manufacturer shall have a minimum of five years of experience in the sensor and lighting control industry. Sensors and related relays shall be compatible with the specific lighting types controlled. All sensors shall be of the same manufacturer, mixing brands of sensors is not acceptable.
 - A. DUAL TECHNOLOGY WALL SWITCH: Where units are indicated provide a sensor that meets the following minimum requirements:
 - 1. Sensor shall utilize PIR (Passive Infrared) to turn on the lights and then PIR or US (Ultrasonic) technologies to keep lights on.
 - 2. Sensor shall incorporate an inrush current limiter circuit to protect the relay contacts.
 - 3. Sensor shall utilize single or dual dry relay contacts for control of the lighting loads. Contractor shall verify requirements in coordination with the drawings.
 - 4. Sensor shall have a self-adjusting time delay, selectable 5, 15 and 30 minutes.
 - 5. Sensor shall have automatic sensitivity adjustment and be microprocessor controlled.
 - 6. Sensor shall have light level sensing 0 to 200 footcandles.

- 7. Sensor shall have a 180 degree field of view, coverage up to 800 square feet and shall detect 6 inches of hand movement towards the sensor up to 300 square feet; and body motion towards the sensor up to 1000 square feet.
- 8. Sensor shall be rated for 0 to 800 watts at 120VAC and 0 to 1200 watts at 277VAC.
- 9. Sensor shall be automatic on and shall have an automatic to off override switch on the unit. Switch shall be equipped with an air gap switch to disconnect power to the lighting load.
- 10. Sensor shall have real time motion indicator on the front of the unit.
- 11. Sensor shall mount to a single gang switch box.
- 12. Subject to compliance with the above requirements. Provide models of one of the following:
 - a. Greengate ONW-D
 - b. Wattstopper
- B. DUAL TECHNOLOGY WALL SWITCH WITH DIMMING AND DAY-LIGHT CONTROL: Where units are indicated, provide a sensor that meets the following minimum requirements:
 - 1. Dual technology sensors shall have one of its two technologies, not require motion to detect occupancy.
 - 2. Sensors shall offer a minimum on timer of at least 15 minutes, in order to prevent all cycling of lamps before they have burned for the lamp manufacturers minimum recommended time period.
 - 3. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 15 minutes.
 - 4. Manual adjustment to the occupancy time delay so as to increase it shall be accommodated.
 - 5. Sensor shall be capable of switching both 120 VAC and 277 VAC.
 - 6. Sensor shall recess into single gang switch box and fit standard GFI opening.
 - 7. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
 - 8. Line and load wire connections shall be interchangeable.
 - 9. Wall switch sensor shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point.
 - 10. Sensor shall be capable of both auto-on and manual operation.
 - 11. Combination photocell/dimming sensors set point and deadband shall be automatically calibrated through the sensors microprocessor by initiating the automatic set point programming procedure. Min and max dim settings as well as set point may be manually entered.

- 12. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Sensor-switch N5X-PDT-D Series
 - b. Wattstopper DW-311 (No Daylight Dimming, use when daylighting is not required)
- C. DUAL TECHNOLOGY CEILING SENSOR: Where units are indicated, provide a sensor that meets the following minimum requirements:
 - 1. Sensor shall incorporate ultrasonic (microphonics) and infrared technologies in a single unit.
 - 2. Sensor shall be Class 2, low voltage; capable of mounting in the ceiling for maximum coverage.
 - 3. Sensor shall use internal microprocessor for motion signal analysis and automatic self-adjustment.
 - 4. Sensor shall have automatic self-adjustment algorithm that adjusts timer and sensitivity settings to maximize performance and minimize energy usage.
 - 5. Sensor shall have manual time-out adjustment from 8 minutes to 32 minutes and automatic time out from 8 minutes to 100 minutes.
 - 6. Sensor shall have test time-out setting of 8 seconds, with automatic return to 8 minutes after one hour if sensor is left in test mode.
 - 7. Sensor's microprocessor shall automatically extend timer by 1 hour in response to recognition to false off condition. After 5 hours, sensor reduces extended time by 30 minutes and continues to reduce by 30 minute increments over the next few days.
 - 8. Sensor's microprocessor shall automatically reduce either PIR or ultrasonic sensitivity in response to false on condition.
 - 9. Sensor microprocessor will automatically monitor PIR background threshold signal level and makes corresponding sensitivity adjustments automatically.
 - 10. Sensor microprocessor algorithm shall incorporate automatic adaptation to continuous airflow.
 - 11. For airflow that is so intense as to mask motion, sensor shall flash indicator LED code to indicate excessive airflow.
 - 12. Sensor's microprocessor shall use a four week learning period and develop a circadian calendar.
 - 13. An internal 24 hour 7 day clock establishes what periods the room is typically occupied, biasing sensor to keep lights on while normally occupied and off when normally unoccupied.
 - 14. Sensor shall have selection settings for the following dual technology schemes:
 - a. High Sensitivity and High Confidence (miser mode)
 - 15. Sensor shall be available with either 180 degrees or 360 degrees coverage pattern.
 - 16. Infrared lens shall have 360 degree field of view. Two types of lens shall be available, standard and extra dense.
 - 17. Sensor shall have a variety of mask inserts for PIR coverage rejection to prevent false tripping.
 - 18. Transducers shall be protected from tampering.

- 19. Sensor shall have manual adjustments for timer and sensitivities and override switches to force manual adjustment mode.
- 20. Sensor shall have adjustable sensitivity from 0% to 100% for both ultrasonic and infrared.
- 21. Controls shall be behind cover to resist tampering. All adjustments shall be accessible from the front of the sensor.
- 22. Sensor shall be available with a photocell adjustment from 20 to 3,000 Lux.
- 23. Sensor shall provide internal operating status and settings confirmation via LED motion lamp indicator.
- 24. Sensor shall have two (if 180 degree) or three (if 360 degree) real time LED motion indicators visible from the front of the unit: Red = infrared; green = ultrasonic.
- 25. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Hubbell-ATD Series
 - b. Sensor Switch-CM-PDT Series
 - c. Wattstopper-DT Series
 - d. Mytech-Omni-DT Series
 - e. Lithonia LMTO Series
 - f. Leviton OSC UOW Series
 - g. Greengate OMC DT Series
- D. 24 VDC POWER/CONTROL PACK: Where units are indicated, provide a power/control pack that meets the following minimum requirements:
 - 1. Control module shall consist of a DC power supply and a dry contact relay for switching a lighting load.
 - 2. Control module shall consist of a DC power supply and a dry contact relay for HVAC control.
 - 3. Control module shall be available in versions to accept 120, and 277 VAC line voltages.
 - 4. Output shall be 24VDC nominal, and shall be inherently safe, low voltage, limited power output (Class 2).
 - 5. Output shall supply 100mA current, in addition to current consumed internally to operate internal relay.
 - 6. Relay shall utilize normally open, silver alloy dry contacts, and shall be rated for a 20A ballast load at 120V and 277V.
 - 7. Relay function shall not require more than 5 mA control current to operate.
 - 8. Control module shall have line voltage wiring, consisting of input voltage and relay contact connections, exiting from one end, and low voltage DC connections, consisting of ground, power, and control wires, exiting from the other end.
 - 9. Control module shall be sized to fit inside a standard 4" x 4" junction box.
 - 10. Control module shall be equipped with a 1/2" EMT threaded male fitting on the line voltage end, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low voltage wiring external.
 - 11. Control module shall be equipable with accessory 1/2" EMT threaded male fitting on the low voltage end, such that it may be mounted to the inside of a ballast

cavity with the box and line voltage wiring internal to the cavity and the low voltage wiring external.

- 12. Slave module shall be available for switching additional circuits. Slave module has same construction and specifications as control module except without power supply function.
- 13. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Hubbell-CU Series
 - b. Sensor Switch-PP-20 Series
 - c. Wattstopper-BEP Series
 - d. Mytech-MP Series
 - e. Lithonia LPCS Series
 - f. Greengate SP20-MV Series
 - g. Leviton OSC/OSA Series

PART 3 – EXECUTION

3.1 INSTALLATION OF LIGHTING CONTROL EQUIPMENT:

- A. Install occupancy lighting control system components and ancillary equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that lighting control equipment complies with requirements.
- B. Comply with requirements of NEC, and applicable portions of NECA's "Standard of Installation" pertaining to general electrical installation practices.
- C. Coordinate with other electrical work, including raceways, and electrical boxes and fittings, as necessary to interface installation of lighting control equipment work with other work.
- D. Contractor shall be on site as required, to adjust lighting control units for proper operation.
- E. Mount the switchpack in a standard 4" junction box. Mount sensor to a standard 4" junction boxes. Refer to manufacturer supplied mounting instructions.
- F. All lighting programing shall meet the requirements of the IECC 2018 or current energy code applied to the project.

3.2 FIELD QUALITY CONTROL:

- A. Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements.
- B. System start-up: Provide a factory authorized technician to verify the installation and test the system.
- C. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- D. Contractor shall visit the job site 3 months after the owner has taken occupancy and adjust any units not operating properly, otherwise remove and replace with new units.
- 3.3 PRODUCT SUPPORT AND SERVICES:
 - A. System Start-Up: Provide a factory authorized technician to verify the installation, test the system, and train the owner on proper operation and maintenance of the system.

Before requesting start-up services, the installing contractor shall verify that:

- 1. The sensors have been fully installed in accordance with manufacturer's installation instructions.
- 2. Low voltage wiring for overrides and sensors is completed.
- 3. Accurate 'as-built' load schedules have been prepared.
- 4. Proper notification of the impending start-up has been provided to the owner's representative.
- 5. Programming of all switches, sensors, power packs, relays, etc. shall be completed by factory authorized technician, prior to final and training.
- B. Factory support: Factory telephone support shall be available at no cost to the owner during the warranty period. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll free number for technical support.
- C. Functional Testing:
 - 1. The owner shall hire a third party that will conduct and certify the functional testing.
 - 2. Lighting controls devices shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working conditions in accordance with the construction documents, manufacturer's instructions and code requirements. The following shall be performed:
 - a. Certify that sensors have been located, aimed and calibrated per manufacturer recommendations.
 - b. Status indicator operates properly.
 - c. Fixtures that are controlled by auto-on controls turn on to permitted level.
 - d. Fixtures that are controlled by manual on controls operate when manually activated.
 - e. Fixtures do not turn on incorrectly due to HVAC or movement outside the controlled area.
 - f. Confirm that occupancy sensors turn off after space is vacated and do not turn on unless space is occupied.
 - g. Simulate unoccupied conditions and confirm that vacancy sensors only turn on manually and turn off after space is vacated.
 - 3. The party responsible for the functional testing shall provide documentation that the installed lighting controls meet or exceed all performance criteria and shall not be directly involved in the design or construction of the project.

3.4 WARRANTY:

A. Manufacturer shall provide a one (1) year limited warranty on lighting control system. A ten (10) year limited warranty shall be provided on the lighting control relays.

3.5 AS-BUILT DRAWINGS:

- A. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
- B. Provide a CD to the owner containing the information specified below. The CD shall include all information required to allow the Owner to change the schedules themselves. The CD shall contain a minimum of following:
 - 1. CAD drawing files of 'as-built' lighting control components and point to point connections.
 - 2. General configuration programming.
 - 3. Job specific configuration programming to include schedule.
 - 4. Tutorial file on complete programming of lighting control system.

3.6 TRAINING

- A. Provide four (4) hours of video taped training in two 2 hour sessions on the operation and use of the lighting control equipment, at job site, at no cost to the Owner.
- 3.7 MANUFACTURER AUTHORIZED PERSONNEL TRAINING:
 - A. Building Operating Personnel Training: Train Owner's building personnel in procedures for starting-up, testing and operating lighting control system equipment.

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1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to panelboards specified herein.
- 1.2 DESCRIPTION OF WORK:
 - A. The extent of panelboard and enclosure work, is indicated by drawings and schedules.
 - B. Types of panelboards and enclosures in this section include lighting and appliance panelboards, and power distribution panelboards.
- 1.3 QUALITY ASSURANCE:
 - A. Provide units that have been UL listed and labeled. Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC pertaining to installation of wiring and equipment in hazardous locations. Comply with NEMA Stds. Pub No. 250, "Enclosures for Electrical Equipment (1000 volt maximum). Pub No. 1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 – PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS:
 - A. Subject to compliance with requirements, provide of one of the following:
 - 1. Cutler Hammer Products, Eaton Corp.
 - 2. GE/ABB
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D Company
- 2.2 PANELBOARDS:
 - A. GENERAL:
 - 1. Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated. Equip with number of unit panelboard devices as required for complete installation. Fully equip "spaces" with hardware to receive breaker or switch of size indicated. Provide CU/AL rated lugs of proper size to accommodate conductors specified.
 - B. POWER DISTRIBUTION PANELBOARDS:
 - 1. Provide dead-front safety type power distribution panelboards as indicated, with switching and protective devices in quantities, ratings, types and with arrangement shown. Equip with aluminum bus bars, full-sized neutral bus and ground bus. Provide fusible or circuit breaker branch and main devices as indicated. Series rated systems are not acceptable. See Section 262815, Overcurrent Protection Devices.
 - C. LIGHTING AND APPLIANCE PANELBOARDS:

- 1. Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangement shown. Provide bolt-on thermal magnetic type branch breakers. Where multiple breakers are indicated, provide with common trip handle. Series rated systems are not acceptable. Equip with copper bus bars, full-sized neutral bus, and ground bus.
- D. PANELBOARD ENCLOSURES:
 - 1. Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage minimum 16-gage thickness. Provide door-in-door hinged fronts. Provide fronts with adjustable indicating trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor. Provide enclosures fabricated by same manufacturer as overcurrent devices contained therein Bolt engraved plastic laminate labels indicating panel name and voltage on the interior and exterior of panelboards.
- E. FINISH:
 - 1. Coat interior and exterior of surface with manufacturer's standard color; baked on enamel finish.
- F. ELECTRICAL IDENTIFICATION:
 - 1. Refer to Section 260553 for requirements.

PART 3 – EXECUTION

- 3.1 INSTALLATION OF PANELBOARDS:
 - A. GENERAL:
 - 1. Install panelboards and enclosures where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", in compliance with recognized industry practices to ensure products fulfill requirements.
 - B. MOUNTING:
 - 1. Provide 4" high concrete curb under floor standing distribution panelboards.
 - 2. Coordinate installation of panelboards and enclosures with cable and raceway installation work. Anchor enclosures firmly to walls and structural surfaces, ensuring they are permanently and mechanically secure. Arrange conductors neatly within enclosure, and secure with suitable nylon ties. Fill out panelboard's circuit directory card upon completion of installation work. Utilize actual final building room numbers, not architectural numbers used on drawings. Identify individual lighting circuits and individual receptacle circuits by room served. Label circuit breakers to identify location of subpanel or equipment supplied using room numbers and equipment names. Include room number with equipment circuit designations. All directories to be typewritten.

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems that are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - 1. Receptacles
 - 2. Switches
 - 3. Cord caps
 - 4. Cord connectors
- 1.3 QUALITY ASSURANCE:
 - A. Comply with NEC and NEMA standards as applicable to construction and installation of electrical wiring devices. Provide electrical wiring devices that have been UL listed and labeled.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS

- 2.1 FABRICATED WIRING DEVICES:
 - A. GENERAL:
 - 1. Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub No. WD 1.
 - B. Provide wiring devices (of proper voltage rating) as follows:

	RECEPTACLE	SWITCHES			
MFGR		<u>1-POLE</u>	<u>3-WAY</u>	<u>4-WAY</u>	<u>W-PILOT</u>
Hubbell	HBL 5352	HBL 1221	HBL 1223	HBL 1224	HBL 1221-PL
Bryant	5352	1221	1223	1224	1221-PL
Pass Seymour	5352	20AC1	20AC3	20AC4	20AC1-RPL
Leviton	5362	1221	1223	1224	
Cooper	5352	1221	1273	1224	1221-PL

- C. Provide devices in colors selected by Architect. Provide red devices on all emergency circuits.
- D. GROUND-FAULT INTERRUPTER:

- Provide general-duty, duplex receptacle, ground-fault circuit interrupters; feed-thru types, capable of protecting connected downstream receptacles on single circuit; grounding type UL-rated Class A, Group A, 20-amperes rating; 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes groundfault trip level; color as selected by Architect. Provide Hospital grade where required elsewhere by specification or drawings. Provide units of one of the following:
 - a. P&S/Sierra
 - b. Hubbell
 - c. Leviton
 - d. Square D
- E. WEATHER-RESISTANT RECEPTACLES
 - 1. Provide weather-resistant receptacles in outdoor locations such as under roofed open porches, canopies, marquees, etc.
 - 2. Provide products of one of the following:
 - a. Pass & Seymour 2095TRWRXXX.
 - b. Hubbell GFTR20XX
- F. CORD CAPS AND CONNECTORS:
 - 1. Provide 3, 4 and 5-wire grounding, cap plugs, and connectors of ampere and voltage rating required, for final equipment, and as indicated otherwise on drawings.
 - 2. Provide products of one of the following:
 - a. Cooper
 - b. General Electric
 - c. Hubbell
 - d. Leviton
 - e. P&S

2.2 WIRING DEVICE ACCESSORIES:

- A. WALL PLATES:
 - 1. Provide coverplates for wiring devices; plate color to match attached wiring devices. Provide nylon coverplates in all finished areas. Provide galvanized steel plates in unfinished areas. Provide blank coverplates for all empty outlet boxes.
- B. WEATHER-PROTECTING DEVICE ENCLOSURES:
 - 1. Where required for compliance with NEC 406-8 (receptacles installed outdoors for use other than with portable tools or equipment), provide weather-tight device covers that provide complete protection with the cord and cap inserted into the wiring device. Provide units that mount on either single or double gang devices.
 - 2. Provide products of one of the following for In Box Horizontal for brick and cast stone:
 - a. Arlington Industries

i. DSHB1C Clear Cover

ii. DSHB1W White Cover

- iii. DSHB1BR Brown Cover
- iv. DSHB1BRC Brown Clear Cover
- 3. Provide products of one of the following for In Box Vertical or Horizontal for Stucco and Metal Sidings:
 - a. Arlington Industries

i.	DSBVM1C	Clear Cover
ii.	DSBVM1W	White Cover
iii.	DSBHM1C	Clear Cover
iv.	DSBHM1W	White Cover

- 4. Provide products of one of the following for roof mounted installations:
 - a. Intermatic WP1020 or WP1030
 - b. P&S WIUC10C or WIUC20c

PART 3 - EXECUTION

3.1 GENERAL

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work. Install devices in boxes such that front of device is flush and square with coverplate. Drawings are small scale and, unless dimensioned, indicate approximate locations only of outlets, devices, equipment, etc. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings before beginning rough-in of electrical work. Adjust locations of all electrical outlets as required to accommodate work in area, and to avoid conflicts with wainscoat, back splash, tackboards, and other items.
- C. Install wiring devices only in electrical boxes that are clean; free from excess building materials, dirt, and debris.
- D. Install blank plates on all boxes without devices.
- E. Delay installation of wiring devices until wiring work and painting is completed. Provide separate neutral conductor from panel to each GFI receptacle.
- F. Install GFI receptacles for all receptacles installed in the following locations:
 - 1. Restrooms, locker rooms, kitchens, within 6 feet of any sink, or when serving vending machines and electric drinking fountains.
 - 2. Indoor wet locations, non-dwelling garages, elevator rooms and pits.
 - 3. Outdoors, and on rooftops.
 - 4. Dwelling unit garages, crawlspaces and unfinished basements, accessory buildings, boathouses, and receptacles for boat hoists.
- G. Where light switches or wall box dimmers are specified, provide a separate neutral for each phase of the branch circuits that switches or dimmers are connected.
- H. Electrical Identification: Refer to Section 260553 for requirements.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES:

A. At time of substantial completion, replace those items, that have been damaged, including those stained, burned and scored.

3.3 GROUNDING:

A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.4 TESTING:

A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of overcurrent protective device work is indicated by drawings and schedules and specified herein. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures; and for installation as integral components of switchboard and panelboards. See Section 262413, Switchgear and Switchboards, and Section 262416, Panelboards.
- B. Types of overcurrent protective devices in this section include the following for operation at 600 Volts and below:
 - 1. Molded case thermal circuit breakers
 - 2. Fuses
- C. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices.

1.3 QUALITY ASSURANCE

- A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent devices.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 – PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS:
 - A. Subject to compliance with requirements, provide products of one of the following (main and branch device manufacturer must be same as panelboard and/or switchboard manufacturer):
 - B. CIRCUIT BREAKERS AND FUSIBLE SWITCHES:
 - 1. Cutler Hammer Products, Eaton Corp.
 - 2. GE/ABB
 - 3. Square D Co.
 - 4. Siemens Energy and Automation
 - C. MOLDED CASE THERMAL TRIP CIRCUIT BREAKERS:
 - Provide factory-assembled, molded case circuit breaker for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers of amperage, voltage, and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Series rated systems are not acceptable. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with

mechanical screw type removable connector lugs, AL/CU rated, of proper size to accommodate conductors specified.

2. Circuit breakers 15 amps through 599 amps shall be molded case thermal trip circuit breakers.

2.2 FUSES

- A. GENERAL: Except as otherwise indicated, provided fuses of type, sizes and ratings and electrical characteristics of a single manufacturer as follows. Provide fuses labeled UL Class L or UL Class R, current limiting and rated for up to 200,000 amperes. Provide Buss KAZ signal activating fuses where required elsewhere in specification.
- B. Where fuses are shown feeding individual or groups of equipment items, comply with manufacturer's recommendation for fusing; adjust fuse size and type as necessary to comply with manufacturer's recommendation.
- C. Provide and install spare fuse cabinet in main electrical room.
- D. MAIN SERVICE AND FEEDER CIRCUITS: For fuse ratings over 600 amperes provide UL Class L Fuses (KRP-C, or A4BQ or LCL or KLPC). For fuse ratings up to 600 amperes, provide UL Class RK1 (KTN-R, KTS-R or A2K-R, A6K-R or NCCR, SCLR or KLN-R, KLS-R). If fuse directly feeds motors, transformers or other inductive load provide UL RK5 time delay (FRN-R, FRS-R or TR-R, TRS-R or ECN-R, ECS-R or FLN-R, FLS-R).
- E. BRANCH CIRCUITS: For motor circuits, transformer circuits, or other inductive loads, provide UL Class RK5 (FRN-R, FRS-R or TR-R, TRS-R or ECN-R, ECN-S or FLN-R, FLS-A). For other circuits, provide UL Class RK1, (KTN-R, KTS-R OR A2K-R, A6K-R or NCLR, SCLR OR KLNR, KLSR).
- F. MANUFACTURER: Subject to compliance with requirements, provide fuses of one of the following:
 - 1. Bussman Mfg. Co.
 - 2. Mersen (Ferraz Shawmut)
 - 3. Reliance Fuse Div./Brush Fuse Inc.
 - 4. Littlefuse, Inc.

PART 3 - EXECUTION

- 3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES:
 - A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
 - B. Coordinate with work as necessary to interface installations of overcurrent protective devices with other work.
 - C. Where a neutral is supplied for equipment of gasoline pumps, install a disconnect/breaker to switch the neutral with the phase conductors when disconnect is opened.
 - D. Install fuses in overcurrent protective devices. For motor circuits, fuse sizes shown on drawings are for general guidance only. Size fuses in accordance with fuse manufacturer's recommendation for given motor nameplate ampere rating. Test operation. If nuisance tripping occurs, increase fuse size and disconnect device (if necessary) as required to provide nuisance free tripping. Adjust fuse size properly for ambient temperature, frequent starting and stopping of motor loads, and for loads with long start times. Include all costs in bid.
 - E. Field test all ground fault protective devices for proper operation; test to be performed by

representative of the manufacturer. Include verification of complete time current trip characteristics.

- F. Electrical Identification: Refer to Section 260553 for requirements.
- 3.2 FIELD QUALITY CONTROL
 - A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

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1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to motor and circuit disconnect switches specified herein.
- 1.2 DESCRIPTION OF WORK:
 - A. Extent of motor and circuit disconnect switch work is indicated by drawings and schedule. Work includes complete installations and electrical connections.
- 1.3 QUALITY ASSURANCE:
 - A. Provide motor and circuit disconnect switches that have been UL listed and labeled. Comply with applicable requirements of NEMA Standards Pub. No. KS 1, and NEC.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS:
 - A. MANUFACTURER: Subject to compliance with requirements, provide products of one of the following (for each type of switch):
 - 1. Cutler Hammer Products, Eaton Corp.
 - 2. Square D Company
 - 3. GE/ABB
 - 4. Siemens Energy & Automation, Inc.

2.2 FABRICATED SWITCHES:

- A. GENERAL: Provide disconnect and safety switches as indicated herein. Provide:
 - 1. General duty switches on 240 Volt rated circuits.
 - 2. Heavy duty switches on 480 volt rated circuits.
 - 3. HP rated switches on all motor circuits.
- B. GENERAL DUTY SWITCHES: Provide general-duty type, sheet-steel enclosed switches, fusible or non-fusible as indicated of types, sizes and electrical characteristics indicated; rated 240 volts, 60 hertz; incorporating spring assisted, quick-make, quick-break mechanisms. Provide single phase or three phase and with solid neutral as required by application. Equip with operating handle that is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application, unless noted. Provide fusible switches with Class R rejection fuse clip kits.
- C. HEAVY-DUTY SWITCHES: Provide heavy-duty type, sheet-steel enclosed safety switches, fusible or non-fusible as indicated, of types, sizes and electrical characteristics indicated; rated 600 volts, 60 hertz; incorporating quick-make, quick-break type mechanisms. Provide single phase or 3 phase, and with solid neutral as required by application, Equip with operating handle that is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application unless noted. Provide fusible

switches with Class R rejection fuse clip kits.

- D. FUSES: Provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for service indicated. See Section 262815 Overcurrent Protective Devices for fuse types. Refer to Section 26 0502 for requirements.
- E. Electrical Identification: Refer to Section 260553 for requirements.

PART 3 - EXECUTION

- 3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES:
 - A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practices to ensure that products fulfill requirements.
 - B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
 - C. Install disconnect switches used with motor driven appliances, and motors and controllers within sight of controller position.
 - D. For disconnect switches serving motors controlled by variable frequency drives, provide late-make, early-break auxiliary contacts on each disconnect switch. Wire auxiliary contact to VFD safety contact, such that disconnecting the motor will shut down the drive first, and closing the switch will start the drive only after power is applied to the motor.

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of Division-26 sections making reference to motor starters specified herein.
- 1.2 DESCRIPTION OF WORK:
 - A. Extent of motor starter work is indicated by drawings and schedules.
 - B. Types of motor starters in this section include the following:
 - 1. AC Fraction Horsepower Manual Starters
- 1.3 QUALITY ASSURANCE:
 - A. Comply with NEC and NEMA Standards as applicable to wiring methods, construction and installation of motor starters. Comply with applicable requirements of UL 508, "Electric Industrial Control Equipment", pertaining to electrical motor starters. Provide units that have been UL-listed and labeled.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS

- 2.1 MANUFACTURER:
 - A. Subject to compliance with requirements, provide products of one of the following (for each type and rating of motor starter):
 - 1. Allen-Bradley Co.
 - 2. Appleton Electric Co.
 - 3. Crouse-Hinds Co.
 - 4. Eaton Corp., Cutler Hammer Products
 - 5. GE/ABB
 - 6. Siemens Energy & Automation, Inc.
 - 7. Square D Co.
 - B. MAINTENANCE STOCK, FUSES: Refer to Section 26 0502 for requirements.

2.2 MOTOR STARTERS:

- A. GENERAL: Except as otherwise indicated, provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated that comply with manufacturer's standard materials, design and construction in accordance with published information and as required for complete installations.
- B. THERMAL OVERLOAD UNITS: Provide thermal overload units, sized to actual running full load current, not to motor plate current. Size heaters for mechanical equipment after air and water balancing have been completed.
- C. AC FRACTIONAL HP MANUAL STARTERS (EQUAL TO SQUARE D CLASS 2510): Provide manual, single-phase, 1 and 2 pole, 300 volt AC max, fractional HP motor starters,
of types, ratings and electrical characteristics indicated; equip with one piece thermal overload relay with field adjustment capability of plus or minus 10 percent of nominal overload heater rating; for protection of AC motors of 1 HP and less. (For manually controlled motors in excess of 1 HP, see Line Voltage Manual Starters specified herein). Provide starter with quick-make, quick-break trip free toggle mechanisms, green pilot lights, and with lock-off toggle operated handle. Mount surface units in NEMA 1 enclosures, unless noted otherwise. Provide NEMA 3R enclosure in exterior or damp location unless noted otherwise. Provide flush mounted units with coverplate to match wiring device coverplates.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR STARTERS:

- A. Install motor starters as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NEMA standards, and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Install fuses in fusible disconnects, if any. Mount chart inside each starter indicating heater type, size, and ampere ratings available.
- C. Electrical Identification: Refer to Section 260553 for requirements.

3.2 ADJUST AND CLEAN:

- A. Inspect operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

3.3 FIELD QUALITY CONTROL:

A. Subsequent to wire/cable hook-up, energize motor starters and demonstrate functioning of equipment in accordance with requirements.

END OF SECTION 26 2913

SECTION 26 4119 - DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Provisions, Division 1 and Division-2 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to demolition.

1.2 DESCRIPTION OF WORK:

- A. Extent of major items of demolition work is indicated by drawings. Other demolition work shall be performed as required to maintain system operation.
- B. The intent of the drawings is to indicate major items affected and not to show every device, outlet, fixture, etc. affected by demolition work.
- C. The drawings do not necessarily reflect as-built conditions. The contractor shall visit the jobsite prior to bidding to determine the overall scope of demolition work.
- D. Refer to sections of other Divisions for applicable requirements affecting demolition work.
- E. Refer to Section 260500 for requirements with regard to power outages affecting the operation of existing electrical systems.

1.3 QUALITY ASSURANCE:

A. NEC COMPLIANCE:

1. Comply with applicable portions of NEC as to methods used for demolition work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- 3.1 GENERAL:
 - A. Demolition work shall be laid out in advance to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary, perform with care, use skilled mechanics of the trades involved. Repair damage to building and equipment. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting of structural members shall not be permitted.

3.2 PATCHING AND REPAIR

- A. The Contractor is responsible for all demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (painted, etc.) to match the adjacent materials, finishes and colors.
- B. Hard surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it shall be the responsibility of this contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, roofing, etc.
- C. The method of patching and repair shall follow good construction practices and all finished surfaces shall match materials and finish wherein the demolition occurred.

3.3 EXISTING EQUIPMENT

A. The following is a part of this project and all costs pertaining thereto shall be included in the base bid.

- B. The new electrical equipment and apparatus shall be coordinated and connected into the existing system as required. Auxiliary systems shall comply, unless otherwise specified.
- C. The existing electrical devices, conduit and/or equipment that for any reason obstructs construction shall be relocated. Provide conduit, wiring, junction boxes, etc. as required to extend existing circuits and systems to relocated devices or equipment.
- D. The new fixtures indicated for existing outlets shall be installed in accordance with the fixture specifications.
- E. When installing equipment in the existing building, it shall be concealed.
- F. All existing electrical equipment and systems in portions of the building not being remodeled shall be kept operational, in service and in working condition throughout the entire construction period. Restore any circuits and systems interrupted. Provide temporary panels, temporary wiring and conduit, etc. as required.
- G. Maintain circuit integrity and continuity of all existing circuits and systems that interfere with or are interrupted by remodel work unless those circuits are to be abandoned completely. Maintain all circuits and systems in operation during construction. Provide temporary panels, temporary wiring and conduit, etc. as required.
- H. Existing raceways may be used where possible in place, except as noted. All circuits, conduit and wire that are not used in the remodeled area shall be removed back to the panelboard, where it shall be labeled a spare with circuit number indicated. Re-used raceway shall meet all requirements for new installations.
- I. The existing light fixtures that are not used in the remodeled area shall be carefully removed, and turned over to the owner or properly disposed of. Those fixtures indicated for re-use shall be thoroughly cleaned, repaired as required, relamped and installed as indicated.
- J. Obtain permission from the Architect and Owner's representative before penetrating any ceiling, floor, and wall surfaces.
- K. Any and all equipment having electrical connections that require disconnecting and reconnection at the same or another location throughout the course of construction shall be included as part of this contract.

END OF SECTION 26 4119

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Types of lighting fixtures in this section are indicated by schedule and include the following:
 - 1. High-Intensity-Discharge (HID)
 - 2. Fluorescent
 - 3. Incandescent/Halogen
 - 4. LED (Light Emitting Diode)
- 1.3 QUALITY ASSURANCE:
 - A. Comply with NEC, NEMA and ANSI 132,1 as applicable to installation and construction of lighting fixtures. Provide lighting fixtures that have been UL-listed and labeled.
 - B. Components and fixtures shall be listed and approved for the intended use by a National Recognized Testing Laboratory (NRTL) including: UL, ETL, and CSA or equivalent
 - C. All led products shall comply with the latest version of Illuminating Engineer Society (IES) publications LM-79 and LM-80.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (for each type of fixture):
 - 1. LED:
 - a. Cree
 - b. Nichia
 - c. Samsung
 - d. Philips Lumiled
 - e. Osram
 - f. Xicato
- 2.2 INTERIOR AND EXTERIOR LIGHTING FIXTURES:
 - A. GENERAL:
 - 1. Provide lighting fixtures, of sizes, types and ratings indicated complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, LED drivers, starters, and wiring. Label each fixture with manufacturer's name and catalog number. Provide all enclosed fixtures with positive latch mechanisms; spring tension clips not acceptable. Provide all exterior fixtures with damp or wet

location label as required by application.

B. SUPPORT REQUIREMENTS:

1. Provide all pendant and stem hung fixtures with flexible ball joint hangers at all points of support. Equip hooks used to hang fixtures with safety latches. Provide all detachable fixture parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain, or safety cable.

C. LIGHT EMITTING DIODE (LED) LUMINAIRES:

- 1. LED luminaires that can be serviced in place shall have a disconnecting means internal to the luminaries to disconnect simultaneously from the source of supply all conductors of the driver, including the grounded conductor. Disconnects shall not be required under the following exceptions:
 - a. Luminaries located in hazardous locations.
 - b. Luminaries used for egress lighting.
 - c. Cord-and-plug luminaries.
 - d. In industrial establishments with restricted public access where conditions of maintenance and supervision ensure that only qualified persons service the installation.
 - e. Where more than one luminaire is installed in a space and where disconnecting the supply conductors to the luminaire will not leave the space in total darkness.
 - f. Provide LED luminaires which are tested in accordance with IES LM-79, diodes tested in accordance with IES LM-80, and provide a minimum R9 rating of \geq 50 (unless specified differently), a CRI rating of \geq than 80 and L70 (6K) = 50,000 hours (IES TM-21). Provide with 0-10V dimming drivers as standard.
 - g. The fixture manufacturer(s) shall warrant the luminaires, in their entirety, to be free from defects in material or workmanship for at least 5 years from date of manufacture. Provide warranty in accordance with other sections of this specification and <u>include a certificate of warranty from the fixture manufacturer with extended warranty information and proper forms and procedure description.</u>

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standards of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
- B. Coordinate with other work as appropriate to properly interface installation of lighting fixtures with other work. Consult architectural reflected ceiling plan for exact location of all lighting fixtures.
- C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of fixtures. Support all ceiling mounted fixtures from the building structure; independent of the ceiling system, unless noted. Support each recessed fixture (fluorescent incandescent, and/or HID) from the building structure with #12 ga. steel wire attached to each corner (in addition to supports normally provided for attachment to the ceiling system). Provide backing supports above (or behind) sheetrock, plaster and similar ceiling and wall

materials. Support surface mounted ceiling fixtures from channel. Support ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. Feed each recessed fixture directly from an outlet box with flex conduit as required; do not loop from fixture to fixture. See plans for additional details.

- D. FIXTURE WHIPS:
 - 1. Provide each lay-in light fixture with at least 36" (Not to exceed 72") of 3/8" steel flexible conduit.
 - 2. With-in spaces utilizing 0-10v control schemes ie: Room Controllers, the fixture whip shall be comprised of a MC-PCS Cable (see Section 26 0532 Conduit raceways) with at least 36" and not to exceed 72" in length located above removable grid ceilings.
- E. Coordinate lighting in mechanical room with duct and equipment locations to avoid obstruction of illumination.
- F. Provide gypsum board protection as required, (acceptable to fire official having jurisdiction) to ensure fire rating of each ceiling that the fixtures are installed in.
- G. COORDINATION MEETINGS:
 - 1. Meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each light fixture mounting condition with ceiling type. During second meeting, coordinate fixture layout in each area.
 - 2. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all fixtures and duct work in all areas.
- H. ADJUST AND CLEAN:
 - 1. Clean lighting fixtures of dirt and debris upon completion of installation.
 - 2. Protect installed fixtures from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish.
- I. SPARE PARTS: Refer to Section 26 0502 for requirements.
- 3.2 FIELD QUALITY CONTROL:
 - A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements.
 - B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise remove and replace with new units, and proceed with retesting.
 - C. At the time of Substantial Completion, replace lamps in interior lighting fixtures that are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer.
 - D. GROUNDING:
 - 1. Provide equipment grounding connections for each lighting fixture.

END OF SECTION 26 5100

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PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Types of lighting fixtures in this section are indicated by schedule and include the following:
 - 1. LED (Light Emitting Diode)
- B. Excavation and backfilling for exterior area lighting poles, standards and foundations are specified in applicable Division-26 general provision sections.
- C. Concrete for embedding poles, and for pole foundations and footings is specified in other sections of specification. Provide pole bases under this section of the specification.
- D. Refer to other Division-26 sections for cable, wire and connectors required in connection with exterior area lighting poles and standards.

1.3 QUALITY ASSURANCE:

- A. Comply with NEC, NEMA and ANSI/IES requirements as applicable to location and installation of lighting poles and standards. Provide lighting components and fittings that are UL-listed and labeled.
- B. Comply with other portions of specification as applicable for forming, splicing, and curing of concrete bases provided under this section.
- 1.4 SUBMITTALS: Refer to Section 26 0502 for requirements.

PART 2 - PRODUCTS

- 2.1 MANUFACTURER: Subject to compliance with requirements, provide products as scheduled on drawings.
 - A. FUSES: Refer to Section 26 0502 for requirements.
 - B. CONCRETE: 3000 psi Class.
 - C. LIGHT FIXTURE POLES: Provide light fixture poles that comply with the following minimum requirements.
 - 1. The pole shaft constructed of seamless aluminum alloy per requirements of ASTM B221. Include a flush covered hand hole in each pole with finish hardware. Provide a permanent marking with the manufacturer name inside the hand hole for easy recognition.
 - 2. Provide aluminum alloy anchor base welded to the pole shaft. Welding must comply with AWS Specification D1.2, Structural Welding Code Aluminum. The complete assembly must be heat-treated to a T6 temper.
 - 3. Provide super durable thermosetting polyester power coat paint, a minimum of 1.5 mils thick along the entire length of the pole.
 - 4. Include aluminum nut covers for a "Shoe Base" trim.

- 5. Provide a 10 year minimum guarantee, which covers the pole structure and paint.
- 6. Provide vibration dampening in poles.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install area lighting units as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NESC and NEMA standards and with recognized industry practices to ensure that lighting units fulfill requirements.
- B. Coordinate with other work as necessary to properly interface installation of roadway and parking area lighting with other work.
- C. Comply with NEC 300-5 (or State of Utah requirement, whichever is most stringent), for raceway burial depth.
- D. Mount lighting units on concrete bases as indicated, complete with anchor bolts and reinforcing bars. Coordinate proper size and location of all bases as required to ensure proper installation. Provide 3000 psi class concrete; hand rub all exposed concrete to uniform, smooth finish.
- E. Deliver poles to job site with factory finish paint.
- F. Set poles and standards plumb. Support adequately during backfilling, or anchoring to foundations.
- G. Provide sufficient space encompassing hand access and cable entrance holes for installation of underground cabling.
- H. Provide Bussman HEB fuseholder (or Littelfuse LEB-XX-S) with "breakaway" receptacles in all conductors running to the top of each pole. Locate fuseholder at hand hole or in base junction box as applicable. Provide KTK fuses in each phase conductor, sized 1.5 times maximum full load current of ballasts served by each conductor. Do not exceed rating of circuit overcurrent protective device. Provide fuse blanks in neutral conductors. Make up all other splices in pole or pole base using Scotchcast 400 Resin for watertight connection.

3.2 GROUNDING:

A. Provide equipment grounding connections for each lighting unit installation.

END OF SECTION 26 5600



INFORMATION TECHNOLOGIES 8/31/2018



Canyons School District

Network Cabling Global Specification

Information Technologies

Final Draft Wednesday August 31, 2018

NETWORK CABLING GLOBAL SPECIFICATION

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Scot McCombs Director of IT

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NETWORK CABLING GLOBAL SPECIFICATION

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NETWORK CABLING GLOBAL SPECIFICATION

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I. GENERAL

A. Purpose

- The purpose of this document is to provide a standard defining the structured communications cabling systems to be installed within Canyons School District facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.
- 2. Within this document, the facilities owner is Canyons School District, and shall be referred to as such, or as "Canyons School District" or simply as "Information Technologies". Bidding low-voltage installers shall be referred to as "Contractor".
- 3. This specification defines quality standards and practices common to all Canyons School District Information Technologies enterprise network cabling upgrades and greenfield (new) projects.
- 4. In addition to this global cabling standard, individual projects will also have associated documentation such as Requests for Proposals (RFP), facility drawings, project schedules and requirements pertaining to that particular job. Such collateral will be referred to in this document as "Project Specific Documentation" or simply "Construction Documents". Any conflict between this general specification and any project specific documentation shall be brought to the attention of Canyons School District Information Technologies and must be resolved in writing by Canyons Schools.
- 5. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Canyons School District Information Technologies any design directions that may be improved. All such changes shall be approved in writing from Information Technologies.
- 6. Note that while many portions of this global specification are addressed to "The Contractor", these requirements apply equally to anyone doing the network cabling and infrastructure work within Canyons School District, whether those persons are outside contractors or persons directly employed by Information Technologies.

B. Scope of Work - Typical

- 1. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other associated processes and physical apparatus necessary to turn over the completed system fully warranted and operational for acceptance by Canyons School District Information Technologies
- 2. This specification includes structured cabling design considerations, product specifications and installation guidelines for low-voltage network systems and associated infrastructure including, but not limited to:

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- a. Cabling Sub-system 1 Horizontal Copper
- b. Cabling Sub-system 2 Intra-building Fiber Backbone Cabling
- c. Telecommunications Pathways
- d. Communications Racks
- Communications Grounding Systems e.
- f. Cabling Labeling and Administration
- In addition to systems specifications, this document also addresses applicable codes and standards, contractor qualifications and requirements, system warranties and system testing and acceptance.
- 4. Products to be used in Canyons School District Information Technologies telecommunications infrastructure are listed in "Appendix A" at the end of this document. All approved 'equivalents' must match performance specifications.

С. **Applicable Regulatory References**

- 1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. In cases where listed standards and codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.
- 2. ANSI/TIA:
 - a. ANSI/TIA-526-7-A (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - b. TIA-526.2-A (July 2015) Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable - Adoption of IEC 61280-1-1 ed. 2 Part 1-1: Test Procedures for General Communication Subsystems -Transmitter Output Optical Power Measurement for Single-Mode Optical Fibre Cable
 - c. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology
 - d. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - e. ANSI/TIA-568.0-D (September 2015) Generic Telecommunications Cabling for Customer Premises (supersedes TIA-568-C.0 and TIA-568-C-1)
 - ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards f.
 - g. TIA-568-C.2-1 (July 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 1: Specifications for 100 Next Generation Cabling
 - TIA-568-C.2-2 (November 2014) Balanced Twisted-Pair Telecommunications Cabling and Components h. Standard, Addendum 2: Additional Considerations for Category 6A Patch Cord Testing

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- TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard (will be superseded by ANSI/TIAi. 568.3-D after default ballot)
- TIA-568-C.3-1 (October 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 j. Cabled Optical Fiber and array connectors (will be superseded by ANSI/TIA-568.3-D after default ballot)
- k. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
- 1 ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)
- m. ANSI/TIA-569-D (April 2015) Telecommunications Pathways and Spaces
- n. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding
- ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard 0.
- ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure p.
- ANSI/TIA-607-C (November 2015) Generic Telecommunications Bonding and Grounding (Earthing) for a. **Customer Premises**
- ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure r. Standard
- s. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems
- ANSI/TIA-942-B (July 2017) Telecommunications Infrastructure Standard for Data Centers (will be t. superseded by ANSI/TIA-942-B after balloting)
- u. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard For Industrial Premises
- v. ANSI/TIA-1005-A-1 (January 2015) Telecommunications Infrastructure Standard For Industrial Premises, Addendum 1- M12-8 X-Coding Connector - Addendum to TIA-1005-A
- w. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
- ANSI/TIA-1183-1 (January 2016) Measurement Methods and Test Fixtures for Balun-Less х. Measurements of Balanced Components and Systems, Extending Frequency Capabilities to 2 GHz -Addendum to TIA-1183
- y. ANSI/TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- ANSI/TIA-1179 (July 2010) Healthcare Facility Telecommunications Infrastructure Standard Ζ.
- aa. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities
- bb. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)
- cc. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables

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- dd. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard Type MPO-16
- ee. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO
- ff. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard
- gg. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
- hh. TSB-184-A (March 2017) Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling
- ii. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field
- jj. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths
- kk. TIA-TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points
- II. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems
- mm. TIA-492AAAD (October 2009) Detail specification for 850-nm laser-optimized, 50-um core diameter/125um cladding diameter class la graded-index multimode optical fibers
- nn. TIA-455-243 (March 2010) FOTP-243 Polarization-mode Dispersion Measurement for Installed Singlemode Optical Fibers by Wavelength-scanning OTDR and States-of-Polarization Analysis
- oo. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques
- 3. ISO/IEC
 - a. ISO/IEC 11801 Edition 2.2: Information Technology Generic Cabling For Customer Premises
 - b. ISO/IEC 24702 Edition 1.0: Information Technology Generic Cabling Industrial Premises
 - c. ISO/IEC 24764 Edition 1.0: Information Technology Generic Cabling Systems For Data Centres
 - d. ISO/IEC 14763-2 Edition 1.0: Implementation and Operation of Customer Premises Cabling Part 2: Planning and Installation
 - e. ISO/IEC 14763-3 Edition 1.1: Implementation and Operation of Customer Premises Cabling Part 3: Testing of Optical Fiber Cabling

4. National Electric Codes

- a. National Electrical Safety Code (NESC) (IEEE C2-2012)
- b. ANSI/NFPA 70-2011, National Electrical Code© (NEC©)
- c. ANSI/IEEE C2-207, National Electrical Safety Code®
- d. National Electrical Code (NEC) (NFPA 70)
- 5. OSHA Standards and Regulations all applicable

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- 6. Local Codes and Standards all applicable
- 7. BICSI Building Industry Consultative Services International
 - a. Telecommunications Distribution Methods Manual, 13th Edition
 - b. ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
 - c. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
 - d. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
 - e. Network Systems and Commissioning (NSC) reference, 1st Edition
 - f. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
 - g. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 - h. AV Design Reference Manual, 1st Edition
 - i. Network Design Reference Manual, 7th Edition
 - j. Outside Plant Design Reference Manual, 5th Edition
 - k. Wireless Design Reference Manual, 3rd Edition
 - I. Electronic Safety and Security Design Reference Manual, 3rd Edition
 - m. Commercial Installation On-the-Job Training Booklet
 - n. Telecommunications Project Management (TPM) reference, 1st Edition
- 8. Anywhere cabling standards conflict with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
- 9. Anywhere standards, codes, specifications or project documents conflict, Contractor shall default to the standards of the country where the installation is taking place, or default to the more stringent of either. Where such resolutions are not clear, it is the responsibility of the Contractor to bring this to the attention of the local Canyons School District project manager to receive clarification in writing.
- 10. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.
- 11. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.

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D. Substitution Policy

- This is a performance-based specification based on the experience of Canyons School District Information Technologies in providing exceptional solutions for all of our facilities and departments. As such, substitution of specified systems is discouraged, but allowed if Contractor strictly follows the Canyons Substitution Policy outlined below. The right to determine suitability, compatibility, or acceptability of product/service offerings belongs exclusively to Canyons School District.
- 2. Contractors offering product substitutions or equivalents are responsible for showing equal or superior mechanical and transmission performance specifications to those products listed herein.
- 3. The process for substituting products other than those specified is as follows:
 - a. Any Contractor wishing to offer structured cabling or associated infrastructure products other than those specified should submit a request for product substitution in writing at least ten (10) business days prior to the closing of the bid for which the substitution is requested.
 - b. Written requests for substitution should be accompanied by three samples of the substitution product along with associated drawings, specification sheets and engineering documents for evaluation by Canyons School District.
 - c. Any copper or fiber cabling products that carry signal shall be accompanied by third party laboratory performance test reports from an NRTL (Nationally Recognized Testing Laboratory) proving equivalency in transmission performance.
- 4. Equal product acceptance is exclusively at Canyons School District discretion.
- 5. Contractor shall assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

E. Contractor Qualifications

1. General

- a. Contractor must have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.
- b. Contractor shall have offices and service personnel based with a fifty-mile radius of Canyons School District and be capable of same-day response to service calls.
- c. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
- d. Contractor shall have the responsibility to obtain any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.
- e. Contactor shall be a current Panduit ONE[™] Partner, Silver or above, Leviton/Berk-Tek Certified Installer, Siemon/Mohawk Certified Installer, or accepted substitute manufacturer (See Substitution Policy). A copy of the corporate manufacturer certification must be included with quote.

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- f. At least 30 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate, Leviton/Berk-Tek Certified Copper Technicians certificate, Siemon/Mohawk Certified Installer certificate, or accepted substitute manufacturer, to install copper distribution systems.
- g. At least 30 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate, Leviton/Berk-Tek Certified Fiber Technicians certificate or accepted substitute manufacturer certificate, to install fiber distribution systems
- h. The Telecommunications contractor must provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:
 - Initiate and coordinate tasks with the Canyons School District Information Technologies Project Manager and others as specified by the project schedule.
 - Provide day to day direction and-site supervision of Contractor personnel.
 - Ensure conformance with all contract and warranty provisions.
 - Participate in weekly site project meetings.
 - This individual will remain project manager for the duration of the project. The contractor may change Project Manager only with the written approval of Canyons School District Information Technologies.
- i. Contractor Project Manager must be manufacturer certified in the copper and fiber information distribution systems to be installed.
- 2. References
 - a. Communications Contractor shall provide with bid, a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve month period).
- 3. Termination of Services
 - a. Canyons School District Information Technologies reserves the right to terminate the Communication Contractor's services if at any time the Information Technologies Engineer determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.
 - b. Contractor's appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.
 - c. Dress displaying lewd or controversial innuendos will strictly be prohibited.
 - d. Conduct on Canyons School District Information Technologies property will be professional in nature.
 - e. Any person in the Contractor's employ working on a Canyons School District Information Technologies project considered by Canyons School District Information Technologies to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable to the Information Technologies, such person shall be removed from work on the Canyons School District Information Technologies project.
 - f. Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.

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- 4. Other Contractor Responsibilities
 - a. Confirmation of Pathway and Cable Manager Sizing:
 - Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 30% fill according to manufacturer's fill charts based on projected cable densities when racking systems and cabling pathways are fully populated.
 - Pathways overfilled upon installation will not be accepted and shall be remedied at Contractor expense.
 - b. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.
 - c. Contractor must remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors must consider this when placing bids.
 - d. Contractor shall abide by the regulations set by local Canyons School District's Security Policy pertaining to access and conduct while on Canyons School District property.
 - e. Contractor shall all obey all posted speed limits and parking regulations at the Canyons School District facilities where the work is being performed.

F. Warranty

1. General

- a. Contractor shall provide a minimum 3 year warranty on all copper and fiber permanent cabling links. A 25-year extended warranty is desired and will be considered as preferred. Costs to increase the warranty beyond 3 years should be included with ineligible costs, if part of an e-rate project.
- b. Upon acceptance of Warranty the contractor will mail a notification letter to the installer and a notification letter and warranty certificate to Canyons School District Information Technologies.
- 2. Contractor Warranty Obligations
 - a. Installation firm (Contractor) must be a current Panduit ONE[™] Partner, Silver or above, Leviton/Berk-Tek Certified Installer, Siemon/Mohawk Certified Installer, or Canyons School approved equal manufacturer in good standing and shall include a copy of the company installation certification with the bid.
 - b. Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training, Leviton/Berk-Tek Technician Certification Training, Siemon/Mohawk MAC or Canyons School approved equal, and according to all Standards cited in the Regulatory References section of this document.
 - c. Contractor liaison (project supervisor) shall have a current, up-to-date Panduit Certified Technician (PCT) certificate, Leviton/Berk-Tek Certified Technician certificate, Siemon/Mohawk, or Canyons School approved equal in both copper and fiber. Copies of the copper and fiber certificates of the Panduit,

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Leviton/Berk-Tek, or Canyons School approved equal liaison shall be submitted with the bid. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.

- d. Fiber optic cabling system additions and upgrade to existing facilities (Brownfield) shall match the fiber type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same system.
- e. All intra-building new fiber optic installations shall utilize an appropriate construction of OM3 or OM4 multimode fiber as specified herein.
- f. All UTP cable pulled and terminated shall be Category 6a cable and connectivity whether new or legacy systems. The exception to this is the 25 pair Category 5E cable installed for building controls as specified in this document.
- g. All UTP terminations within the Canyons School District Information Technologies greenfield (new) projects shall be terminated using the T568B pin-out (wire map). Legacy additions shall match the copper pin-out of the facility to which cabling is being added-to or upgraded.
- h. Contractor shall install all racking and support structures according to cited Standards in such fashion as to maintain both cited industry standards as well as manufacturer recommendations for uniform support, protection, and segregation of different cable types,
- i. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.
- j. Contractor is responsible for understanding and submitting to Panduit or Leviton/Berk-Tek all documents required prior to project start to apply for the Panduit Certification PLUS or Pan/Gen system warranty, Leviton/Berk-Tek Limited Lifetime Warranty, or Siemon Premium Warranty. These include but are not limited to the project information form and SCS warranty agreement. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.
- k. Contractor is responsible for understanding and submitting to Panduit, Leviton/Berk-Tek, Siemon/Belden, or other, all documents required at project end. These include, but are not limited to: completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.
- Test results shall be delivered in the tester native format (not Excel) and represent the full test report, summaries shall not be accepted. Contact your Panduit, Leviton/Berk-Tek, Siemon/Belden, or Canyons School approved equal's representative for a current list of approved testers, test leads and latest operating systems.
- m. The Communications Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to Canyons School District Information Technologies for the entire warranty period.
- n. The warranty period shall commence following the final acceptance of the project by Canyons School District Information Technologies and written confirmation of Warranty from Panduit, Leviton/Berk-Tek, or Siemon/Belden. These requirements are the same for accepted equivalent manufacturers. See

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"Substitution Policy" for mandatory procedure when offering substitutions.

END OF SUB-SECTION SECTION I

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II. Installation and Maintenance Guidelines

A. Maintenance of Patch Fields

ANYONS

- 1. Any persons, whether with a Contractor or Canyons School District, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the original system cable management design concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.
- 2. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:
 - a. Use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.
 - b. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.
 - c. All patch cords used shall be of same copper Category or fiber OM/OS designation as the media used in the permanent cabling links.
 - d. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.
 - e. All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front of cabinets or racks will not be accepted and shall be remedied at Contractor's expense.
 - f. Any persons installing or moving fiber optic patch cords for any reason will clean the connector with lintfree wipes and 99% or higher isopropyl alcohol before replacing the connector in a patch or equipment port.
 - g. Any technicians, whether with Canyons School District or Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling conventions in place at that facility.
 - h. Any persons with Canyons School District or installing Contractor performing moves, adds or changes within patch field will record the move according to record system in place at that facility.

B. Cable Pulling and Termination

1. General

- a. Contractor is responsible for installing systems according to all applicable codes and the standards cited in this document.
- b. Contractor shall use grommets to protect the cable when passing through metal studs or any openings that can possibly cause damage to the cable.

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- c. Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.
- d. Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and load ratings.
- e. Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.
- f. Note service loops may not touch the ceiling assembly and if so must be remedied at the Contractor expense.
- g. Label every cable within 12 in. of the ends with self-laminating wire wrap cable appropriate to that cable size. Use a unique number for each cable segment as required by the project documentation and the labeling section of this document.
- h. Dress the cables neatly with hook and loop cable ties in telecommunications rooms. Plastic ties are approved in pathways where cable bundles will not be reentered.
- i. Contractor is responsible for using plenum-rated cable ties in plenum spaces.
- j. Contractors installing cabling systems in Canyons School District facilities shall install plenum rated cable in all instances. Non-plenum cable is not allowed and shall be removed at Contractor's expense.
- a. Copper
 - a. When making additions to legacy systems, Contractor shall match the cabling configuration (pinout) of the existing systems. Legacy systems at Canyons School District Information Technologies are in most cases T568B.
 - b. Within all new (greenfield) installations within Canyons School District facilities, contactor shall use copper pinout T568B.
 - c. All four pair Category 6a cable runs shall be kept to a maximum permanent link length of 83 meters when using a total 10 meters of 28 awg/small diameter patch cords.
 - d. Copper links that are 90 meters in permanent link, shall not exceed 6 meters (total) of patch cords when using 28 awg/small diameter patch cords.
 - e. Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.
 - f. No pathway, including conduits shall have greater than a 30% fill per manufacturer fill charts. Contractor is responsible for bringing to the attention of Canyons School District Information Technologies project manager any insufficiently sized conduit or cable pathways in project documentation.
 - g. Keep Category 6a cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.
 - h. All copper horizontal cabling shall have slack service loops no less than 12" at the work area (equipment outlet) and not less than 3 feet in the telecommunications room. Provide a 25' service loop for all cables for cameras.
 - i. Slack at the work area may be stored in the ceiling and in the telecommunications room may be wall

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mounted or contained in pathways or racking systems if done in a neat, workmanlike fashion.

- j. Service loops shall be stored in such fashion as to not violate bend radius, slack touching the drop ceiling is not allowed and must be remedied at Contractor expense.
- k. Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.
- I. All UTP patching shall be accomplished using Category 6a rated modular patch panels as indicated elsewhere in this document.
- m. All removed copper cable is to be disposed of in a Canyons School District Information Technologies recycling bin designated for "copper", or removed from the property to be disposed of by Contractor if this is the instructions in the project documentation.

b. Fiber

- a. When making additions to legacy systems, Contractor shall match the fiber type and fiber connectors used within that system.
- b. Within all new (greenfield) fiber installations within Canyons School District Information Technologies, contactor shall use Panduit OptiCam, Leviton FastCam, Siemon/Beldenor or Canyons School approved equal LC connectors as specified in the fiber section of this document.
- c. When installing fiber cable, Contractor shall maintain a minimum bend radius, both under pulling load and installed, per requirements outlined within TIA standards, or manufacturer's recommendations, whichever is the most stringent.
- d. Fiber terminations shall be done according to recommendations of TIA, manufacturer's requirements and accepted industry best practices.
- e. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered or loose-tube strands will not be tolerated and shall be remedied at Contractor's expense.
- f. Contractor shall use fusion splices when terminating loose-tube fiber.
- g. Contractor shall perform test setup and testing according to guidelines in the "Testing and Acceptance" section of this document.
- h. All fiber backbone links will extend from each IDF directly to the MDF (Home Run) except where agreed to by exception with Canyons School District Director of IT.

END OF SUB-SECTION SECTION II

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III. Cabling Systems and Associated Infrastructure

A. Cabling Subsystem I – Horizontal Cabling System

- 1. Slack (Service Loops) in Horizontal UTP Cable
 - a. Contractor shall provide a minimum 12" slack or service loop at the equipment outlet (work area) on each terminated copper horizontal permanent link. Work area slack shall be contained within boxes behind the faceplate only if this may be done easily without violating cable bend radius.
 - b. Where there is not sufficient space in the work area box, Contractor may pull work area slack into the ceiling space and properly store service loop with appropriately rated hook and loop cable ties. Cable slack shall in no instances touch the ceiling grid or associated drop ceiling components or fixtures.
 - c. Contractor shall provide a minimum of 10 feet slack or service loop in the horizontal telecommunications room on each terminated copper horizontal permanent link, to be stored on the wall backboard using appropriate mounting fixtures built to that purpose (i.e. D-rings).
 - d. Contractor should consult project-specific documentation or their Canyons Schools project liaison for other mounting methods where wall mount is not an option.

2. Metal Conduit

- a. Cable in horizontal runs in classrooms shall be routed and contained in metal conduit.
- b. No conduits shall have greater than a 30% fill per manufacturer fill charts. Contractor shall size conduit large enough to accommodate 50% growth. (i.e., conduit for 4 cables shall be sized to accommodate 6 cables) Contractor is responsible for bringing to the attention of Canyons School District Information Technologies project manager any insufficiently sized conduit or cable pathways in project documentation.

3. Electrical Boxes

- a. Contractor shall size work area boxes to accommodate no less than 12" cable slack on each terminated Category 6a UTP cable run.
- b. Contractor shall use double-gang boxes behind single-gang faceplates if necessary for storing 12" cable slack (service loop) without violating minimum bend radius of 4X cable outer diameter.
- c. In work areas where slack storage in cable box violates cable bend radius, Contractor should pull slack into ceiling and affix with plenum rated hook and loop (re-enterable) cable ties. If drop ceiling is present. Cable shall under no circumstances be laid upon drop ceiling.
- 4. Copper Jacks Category 6A
 - a. Category 6a, eight-position copper jacks shall be Panduit Mini-Com® TX6A™ 10Gig UTP, Leviton/Berk-Tek, or Canyons School approved equal Jack Modules.

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- b. Category 6a jacks at the work area shall be color black unless otherwise indicated in project-specific documentation.
- c. Category 6a jacks shall further meet the following requirements:
 - Exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA standards
 - Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
 - Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
 - Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.
 - Include MaTriX split foil tape to suppress the effects of alien crosstalk, allowing 10 Gb/s transmission even in high density 48-port, 1RU patch panels.
 - Utilize patent-pending enhanced Giga-TX ™Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
 - Meets ANSI/TIA-1096-A contacts plated with 50 microinches of gold for superior performance.
 - Rated for 2500 cycles with IEEE 802.3af / 802.3at and proposed 802.3bt type 3 and type 4
 - Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.
 - Have available a high-volume "gun-style" optional termination tool (TGJT) that reduces termination time by 25% and is ideal for high volume installations.
 - Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.
 - Employ a blue termination cap to designate Category 6A performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.
 - Have range to terminate 4-pair, 22 26 AWG, 100 ohm, solid or stranded twisted pair cable.
 - Utilize a universal termination cap is color-coded for T568A and T568B wiring schemes for flexibility across installations.
 - Accept 6 and 8-position modular plugs without damage to conductor pins.
 - Identified options that include optional labels and icons.
 - Be compatible with Mini-Com ® Modular Patch Panels, Faceplates, and Surface Mount Boxes.
 - Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects, saving time and money associated with data security breaches, network downtime, repair, and hardware replacement
 - Have an optional dust cap keeps out dust and debris while not in use

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- d. See Appendix A for part numbers.
- 5. Flush Mount Equipment Outlets (Faceplates)
 - a. When adding horizontal cabling to existing facilities Brownfield within Canyons School District, Contractor shall match the existing cable plant in regards to color of existing raceway and faceplates.
 - b. Unless otherwise instructed on project-specific documentation, all Canyons greenfield (new) projects shall use Panduit Mini-Com® Classic Series sloped faceplates, Leviton faceplates with label cover, of international white (IW) color, or a Canyons School District approved equal.
 - c. Plastic sloped faceplates shall be in 4 or 6-hole single-gang configuration, or double-gang 8 hole configurations as needed for the number of cables at that workstation.
 - d. Plastic faceplates for greenfield applications shall further have the following properties:
 - Accept Mini-Com[®] or Leviton Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - Include label/label covers for easy port identification.
 - Replacement label/label covers available.
 - Optional icons available.
 - e. Some greenfield projects for Canyons School District will require Panduit Mini-Com® or Leviton stainless steel faceplates with label fields, in single-gang 4-hole or double-gang 8-hole configurations, (or Canyons approved equivalent). See project-specific documentation or consult the Canyons project liaison if clarification on faceplate type is needed.
 - f. Stainless faceplates, where used, shall meet the following criteria:
 - Accept Mini-Com[®], Leviton Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - Include label/label covers for easy port identification.
 - Replacement label/label covers available.
 - Impact-resistant 304 stainless steel suitable for light industrial environments.
 - g. Contractor shall use blank inserts to reserve space on any unused positions (holes) in plastic or stainless plates.
 - h. See Appendix A for part numbers.
- 6. Horizontal Copper Cable
 - a. Inside 4 pair horizontal cable for Canyons School District facilities shall be CAT6a high-performance, jacketed, plenum rated General Cable, or Canyon School approved equivalent. Jacket colors shall be as follows: green to security cameras, gray to non-networked infrastructure [e.g., lighting controls, motion/fire sensors], blue to all network data drops, and yellow to A/V controllers and devices.

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- b. In addition, inside 4 pair Category 6a UTP copper cable must meet the following mechanical and performance criteria:
 - UL Listed CMP-LP, UL Limited Power (LP) Certified
 - Meet TIA TSB-184-A/ IEEE P802.3bt "LP" rating for Limited Power cable requirements
 - Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA channel standards.
 - Exceeds requirements of ANSI/TIA-568-C.2 and IEC 61156-5 Category 6A component standards.
 - Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
 - Meets requirements of ANSI/TIA 862
 - Meets requirements of ICEA S-116-732
 - Third party tested to comply with ANSI/TIA-568-C.2.
 - Cable diameter: Plenum 0.250 in nominal.
 - Installation temperature range: (0°C to 60°C).
 - Operating temperature range: (-20°C to 90°C).
 - Include Encapsulated Isolation Wrap to suppress the effect of alien crosstalk allowing 10 Gb/s transmission, while minimizing cable diameter.
 - Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.
- c. Outside run 4 pair horizontal cable for Canyons School District facilities shall be high-performance, black jacketed, General Cable CAT6a OSP cable constructed for wet or outside-plant applications, or Canyon School approved equivalent.
- d. In addition, outside run 4 pair Category 6a UTP copper cable must meet the following mechanical and performance criteria:
 - Outdoor horizontal cable drops shall use 23 AWG category 6A 4-pair UTP outdoor cable.
 - Cable jacketing shall be black.
 - Cable shall be intended for outdoor installation in buried conduit or as aerial cable.
 - Installation temperature range (-30 to +60C)
 - Operation temperature range (-45 to +80C)
 - The cable core shall be Gel-filled construction to prevent moisture migration in underground and wet applications.
 - OSP type cables shall have a nominal diameter less than or equal to .365"
- e. See Appendix A at the end of this document for cable part numbers.
- 7. Distributor I (Horizontal Patch Panels)

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- a. Canyons School District Information Technologies copper patch panels in the horizontal patch fields shall be flat 1 RU or 2 RU Panduit modular Mini-Com® or Leviton Modular Faceplate Patch Panels, or approved equivalent as needed to accommodate UTP cable quantity.
- b. Modular patch panels shall be standard density of 24 ports per rack unit.
- c. Contractor shall populate modular panels with black Panduit or Leviton Category 6a jacks, or approved equivalent as described elsewhere in this document. See Appendix A for part numbers on jacks to go with modular patch panels.
- d. Contractor shall pair modular patch panels in alternating fashion with workgroup switches allowing for use of 12" Category 6a patch cords for one-to-one switch patching, eliminating the need for horizontal cable managers between the switches and patch fields. See illustration below for example of one-to-one switch patching strategy.



Example of one-to-one switch patching

- e. Patch Panels shall further meet the following criteria:
 - Have release snap feature on faceplate to allow front access to installed modules.
 - Accept Mini-Com®, Leviton or Canyons School approved equal Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - Be available in label versions available for easy port identification, with replacement label/label covers available.
 - Mount to standard EIA 19" racks or 23" racks with optional extender brackets.

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- Be available in angled patch panels to facilitate proper bend radius control and minimize the need for horizontal cable managers.
- f. For detailed part numbers see "Appendix A" at the end of this document.
- 8. Copper Patch Cords
 - a. Copper patching of Category 6a links in Canyons School District facilities shall use blue Panduit 28 awg "small diameter" slim patch cords, Leviton High-Flex HD6, or Canyons School approved equal.
 - b. Security camera patch cables shall be green. If other color patch cords are needed to designate particular applications, see Appendix A for instructions on changing patch cord colors.
 - c. In telecommunications rooms utilizing individual workgroup switches, Contractor shall alternate patch panels with switches, using 12" patch cord lengths in "one-to-one" switch patching strategy as indicated in the patch panel section of this specification (above).
 - d. Core (chassis) switches shall utilize whatever length patch cords necessary for an efficient and neat, workmanlike installation.
 - e. Small diameter patch cords shall have the following characteristics:
 - Cable diameter not more than 0.185 in. (4.7mm) nominal.
 - Category 6A/Class EA channel and component performance.
 - Exceeds all ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA electrical performance requirements for all frequencies from 1 to 500 MHz
 - FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
 - IEC compliance: Meets IEC 60603-7
 - PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
 - Operating temperature: 14°F to 140°F (-10°C to 60°C).
 - Storage temperature: -40°F to 158°F (-40°C to 70°C).
 - Plug housing: UL94V-0 rated clear Polycarbonate.
 - Contacts: Gold plated phosphor bronze.
 - RoHS compliance: Compliant.
 - Flammability rating: CM/LSZH dual rated.
 - f. Note: These patch cords utilize 28 AWG conductors which do not meet the 22 to 26 AWG conductor size of patch cable referenced in ANSI/TIA-568-C.2, resulting in an increased attenuation de-rating value of 1.9. These patch cords support 96-meter channels that include 90-meter permanent links. And 6 meters of patch cord, or supports 93-meter channels with 10 meters of patch cords included in the channel.
 - g. See Appendix A for part numbers.

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- 9. Surface Mount Raceway
 - a. On brownfield installations, Contractor shall match raceway to that already installed in the facility unless instructed otherwise in project-specific documentation.
 - b. On greenfield installations where environment (cinder block walls) or project documentation requires cable to be surface-mounted in the work area; horizontal cable shall be routed through Panduit LD10 International White (color), Leviton plastic latching-duct raceway or Canyons approved equivalent.
 - c. Areas requiring power and data be run through single raceway with partition (separator), Contractor shall utilize Panduit LDP10, Leviton, or Canyons School approved equal raceway or T-70 raceway system as needed to accommodate all cable with not more than a 30% fill according to manufacturer fill tables.
 - d. No raceway shall have greater than 30% fill upon installation, providing room for at least 50% growth in additional cables: i.e., a work area requiring 4 cables, raceway shall be sized to hold 6.
 - e. Contractor is responsible that raceway installation includes all associated fittings, drop ceiling fittings, couplers and 1" control-bend-radius fittings where appropriate.
 - f. Contractor shall not rely on the pressure sensitive adhesive foam to mount raceway, but rather use adhesive to hold raceway in place while screwing down the raceway to the structure beneath using anchors appropriate to the wall type at intervals not to exceed 2 ft (24 inches).
 - g. Standard LD-10 Panduit, Leviton or Canyons School approved equal raceway shall have the following features:
 - For routing data and low voltage cabling.
 - One-piece hinged design allows cables to be laid in.
 - Factory applied adhesive backing speeds installation.
 - FT4 rated.
 - Terminates using surface mount outlet box solutions, Panduit Mini-Com, Leviton or Canyons School approved equal surface mount boxes.
 - h. Installations requiring raceway shall use the same faceplates used in flush-mount applications as specified in this document, mounted on Panduit "JB1", Leviton surface boxes, or Canyons approved equivalent. Contractor shall not rely on adhesive-backing to hold surface boxes in place, but must use appropriate wall anchors for firm, permanent installation.
 - i. Some Canyons facilities may require metallic raceway systems. Consult project-specific documentation or the Canyons School District project liaison if clarification on raceway type is needed.
 - j. See Appendix A at the end of this document for part numbers.

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C. Cabling Subsystems II - Intrabuilding Backbone Fiber

1. Fiber Cable

- a. On additions to existing Canyons School District fiber cable plant (brownfield projects), Contractor shall match existing fiber and connector types.
- b. In new (greenfield) Canyons School District projects, backbone fiber running between telecommunications rooms on the same floor, or between floors in the same building shall be General Cable indoor/outdoor, Berk-Tek, plenum-rated, armored, 50 micron cable of 12 or 24 strand count, or Canyons approved equal. See "Substitution Policy" for mandatory process if offering equivalents.
- c. Contractor shall install OM4 version of cable described for all telecommunications spaces that are spaced 300 meters or closer for use with 10G Ethernet. Note this will be almost all instances in Canyons School facilities.
- d. Fiber optic cable shall further have the following features:
 - Product Construction: Fiber: 4–144 fibers, 900 µm tight buffer, Color-coding per TIA/EIA 598
 B.
 - Overall Strength Member: Water-swellable aramid fiber yarn
 - Inner Jacket: Flame-retardant compound.
 - Armor: Interlock aluminum.
 - Outer Jacket: Flame-retardant compound, UV-resistant black jacket, Sequential footage markings/
 - Features: Interlock armor provides outstanding mechanical protection, Interlock armor is flexible and easy to use tight buffer provides individual fiber protection, sub-units are numbered for identification.
 - Performance: Temperature: Storage -40°C (-40°F) to +70°C (+158°F), Installation 0°C (+32°F) to +50°C (+122°F), Operating -20°C (-4°F) to +70°C (+158°F).
 - Minimum Bend Radius: 20 X OD—Installation, 10 X OD—In-Service.
 - Maximum Crush Resistance: 1,500 lbs/in (2,627 N/cm).
 - Applications: Harsh premises environments requiring heavy-duty protection, outdoor use in ducts and underground conduits.
 - ETL Type OFCP for installation in any premises location when installed in accordance with NEC article 770.154 and 770.179.
 - Compliances: ETL Listed Type OFCP, CSA FT6, TIA 568 C.3, ICEA S-104-696, GR-409, RoHS Compliant Directive 2002/95/EC.

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- e. Contractor shall bond to ground armor from fiber backbones at both ends as indicated in the grounding section of this document; using armored cable grounding kits listed in the Appendix A grounding section.
- f. See Appendix A for all fiber cable part numbers.
- 2. LC Fiber Connectors
 - a. All tight-buffered indoor fiber trunks shall be terminated using Panduit LC OptiCam®, Leviton FastCam Fiber Optic Connectors or Canyons approved equal.
 - b. LC cam connectors shall further have the following properties:
 - Be a TIA/EIA-604 FOCIS-10 compatible connector that exceed exceeds TIA/EIA-568-B.3 requirements.
 - Have connector backbone and boot colors that follow TIA/EIA-568-C.3 suggested color identification scheme.
 - Have insertion loss: 0.3dB average (multimode and singlemode).
 - Have return loss: >26dB (10Gig ™multimode), >20dB (multimode), >50dB (singlemode).
 - Be a spring-loaded "Senior" rear pivot latch LC connector.
 - Be a pre-polished cam style termination for in less than half the time of field polish connectors.
 - Have patented re-termination capability provides yield rates approaching 100%.
 - Feature a factory pre-polished fiber end face eliminates time-consuming field polishing to reduce installation costs, labor, scrap and the number of tools required.
 - Be cam activated, with fiber and buffer clamp mechanisms that provide superior fiber and buffer retention with less sensitivity to fiber tensile loading.
 - Utilize OptiCam® or FastCam Termination Tools that simplifies tooling and termination, and virtually eliminates operator error by providing a visual indication of proper termination after the cam step has been completed.
 - Have a range of cable retention boot assemblies that consistently provide higher than industry standard cable retention.
 - Include a non-optical disconnect that maintains data transmission under tensile loads for jacketed cable.
 - Have ability to accept 900µm tight-buffered fiber with included boot(s), and accept 1.6mm 2.0mm and 3.0mm jacketed cable with available OptiCam ®Cable Retention Boot Assemblies (ten per package).
 - c. See Appendix A for part numbers on LC fiber connectors.
- 3. Fiber Enclosures
 - a. Fiber cable terminations shall be contained in 1 RU, or 2 RU Panduit FCE series, Leviton rack mount fiber enclosures, or Canyons approved equal.
 - b. Contractor shall select enclosure size as needed for the number of fibers projected to be in that telecommunication space when fully populated. The average horizontal telecom room (Distributor 1) will

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not require more than one single RU fiber enclosure, which will house up 48 OM3 fiber strands.

- c. Contractor shall fill any unused enclosure space with a blank fiber adapter panel (FAP).
- d. FCE enclosures shall further have the following properties:
 - Be able to hold Panduit QuickNet ~ Fiber Optic Cassettes, Opticom . Fiber Adapter Panels, or splice modules, Leviton or Canyons School approved equal.
 - Have a slide-out, tilt-down drawer to provide full front access to all fibers and cables.
 - Employ integral bend radius control and cable management appliances for fiber optic patch cords.
 - Have rear cable management for proper slacking/spooling of trunk cable break-outs and interconnect cables.
 - Have multiple trunk cable entry locations and include fiber optic cable routing kit (grommets, cable ties, spools, strain relief bracket, and ID/caution labels) for different installation configurations.
- e. See Appendix A for part numbers.
- 4. Fiber Adapter Panels
 - a. FCE fiber enclosures shall be populated with OM3 fiber adapter panels containing 6 duplex fiber adapters.
 - b. Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.
 - c. Adapter panels shall further have the following features:
 - Loaded with TIA/EIA-604 FOCIS-10 compatible adapters.
 - Exceed TIA/EIA-568-B.3 requirements.
 - Adapter housing colors follow TIA/EIA-568-C.3 suggested color identification scheme.
 - Snap quickly into the front of all Opticom
 © components
 - LC fiber adapter panels are Sr/Jr. to conserve enclosure space.
 - Accept FOCIS-10 compatible senior LC connectors at either end and FOCIS-10 junior LC connectors at the inside end for behind the wall applications.
 - Both ends accept FOCIS-10 compatible senior LC connectors.
 - Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) LC connectors.
 - Choice of phosphor bronze or zirconia ceramic split sleeves to fit specific network requirements; zirconia ceramic split sleeves are recommended for OM4/OM4 multimode and OS1/OS2 single mode applications.
 - Every adapter is laser marked with Q.C. number to assure 100% traceability.
 - LC adapters are also available in QuickNet [™] Fiber Optic Cassettes, Leviton Opt-X fiber modules

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and cassettes or Canyons School approved equal.

- d. See Appendix A for fiber adapter panels and blank adapter panels.
- 5. Fiber Patch Cords
 - a. Fiber patch fields within Canyons School District facilities shall utilize Leviton, Panduit "push/pull" fiber jumpers (fiber patch cords) or Canyons School approved equal that have the following properties:
 - Push-Pull LC Duplex Fiber Optic Patch Cords shall feature the push-pull strain relief boot and duplex clip, to allow users easy accessibility in tight areas when deploying very high density LC patch fields.
 - Jumpers shall be available in OM3, OM4 and single-mode and be available in in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.
 - b. See Appendix A for part numbers.
- 6. Category 5E, 25-Pair Building Controls Backbone Cable
 - a. One gray jacketed, plenum rated, 25 pair Cat 5e cable shall be installed from the MDF to reach every individual IDF to serve as backbone for building controls.
 - b. 25 Pair 5E cable shall be General Cable or Canyons approved equivalent and shall meet the following mechanical and performance criteria:
 - Conductors: 25 pairs of 24 AWG solid bare annealed copper.
 - Insulation: Non-Plenum: Polyolefin Plenum rated Fluoropolymer,
 - Color Code: Standard except no bandmarking; only solid colors.
 - Rip Cord: Applied longitudinally under jacket.
 - Jacket: Plenum: Low-smoke, flame-retardant PVC.
 - Separator: Plenum: Core filler.
 - Nominal Cable Diameter: .5".
 - Nominal Cable Weight (lbs/1000 ft): 160 lbs.
 - Temperature Rating Centigrade (Installed): 0 to +60.
 - Temperature Rating Centigrade (Operation): -20 to +75.
 - c. 25 pair 5E control backbone shall be terminated on wall mount 100 Pr 110 blocks with C5 clips at the MDF end and on a 24-port patch panel in the IDF end.
 - d. The patch panel in the IDF end is to be installed below the fiber enclosure at the top of the rack with one available rack unit reserved below it.
 - e. 5E patching in the IDF shall use white jacketed small diameter Panduit, Leviton 5E patch cords or Canyons approved equivalent.

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- f. Copper backbone must likewise be installed in satellite buildings. Consult project-specific documentation or Canyons project liaison is clarification is needed.
- g. See Appendix A for complete part numbers for fiber and copper backbone cable and termination hardware.

D. Cable Pathways

7. J-Hooks

- a. Bundles of 120 Category 6a cables or less may be required to be routed above ceilings using J-hooks. Check project documentation for clarification.
- b. J-hook systems used by Canyons School District Information Technologies shall be Panduit "J-Pro" series, Leviton or School approved equivalent.
- c. Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.
- d. Contractor is responsible for proper sizing of J-hook systems based upon cable count and manufacturers recommendations for fill, with new J-hooks to have not more than 30% fill per manufacturer's fill charts based upon projected worst case future bundle size.
- e. If J-hooks are deemed too small by above criteria, Contractor shall bring this to the attention of Canyons School District for resolution in writing. J-hook pathways that will not have sufficient capacity should be replaced in the design with the proper sized basket tray for future cable additions and flexibility.
- f. J-hook systems used by Canyons School District Information Technologies shall have the following properties:
 - Patented design provides complete horizontal and vertical 1" bend radius control that helps prevent degradation of cable performance.
 - UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.
 - Pre-riveted assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.
 - Wide cable support base prevents pinch points that could cause damage to cables.

 - Durable non-metallic J Hook materials provide the ability to manage and support a large number of cables.
 - Material: Black Nylon 6.6 J Hook with metal attachments.
- g. See Appendix A for part numbers.

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E. 19" Racks and Rack-mount Cable Managers

- 1. Four-Post Communications Racks
 - a. Contractor shall mount IT equipment and patching systems on threaded rail 7 foot, 4-post racks, unless forced to use 2-post due to telecommunications room space constraints.
 - b. All racks shall utilize threaded hole rails. Cage nut rails are banned within Canyons facilities and will not be accepted.
 - c. 4-post racks shall be of 30", 36", or 41.5" depth as needed by mounted equipment. Contractor is responsible for confirming proper depth to be used.
 - d. 4-post racks shall be the 4 Post Cable Management Rack System or Canyons School District approved equivalent, and must have the following features:
 - Independent adjustable front and rear mounting rails can be adjusted while the rack is secured to the floor.
 - Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding installation of rack mount items (shipped numbers up per TIA-606B specifications; can be set to number down by flipping the rails).
 - Rack is UL listed for 2,500 lbs. load rating.
 - Rear rail construction provides a clear ventilation path for side ventilated switches.
 - Multiple mounting holes in top flanges for securing ladder rack.
 - Weld nut construction eliminates the need for a second wrench increasing speed and ease of assembly.
 - Multiple mounting locations for vertical power strips on any of the four posts or on the adjustable mounting rails.
 - PatchRunner[™] and NetRunner[™] Vertical Cable Managers mount directly to the 4 post rack at any of the four corners to provide a flexible end-to-end cable management solution.
 - Paint piercing washers included to electrically bond rack for simplified grounding.
 - e. See Appendix A for part numbers.
- 2. Two-post Communications Racks
 - a. Contractors may use 19", 2-post communications racks only in telecommunication rack spaces too small to use 4-post racks. Prior notification must be given to the CSD Director of IT.
 - b. 2-post racks, when necessary, will be Panduit or Leviton black-powdered aluminum (or Canyons approved equivalent) and have the following properties:
 - 19" EIA rack, aluminum.
 - Dimensions: 96.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).

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- Rack units numbering up from bottom to allow quick and easy location of rack mount items
- UL listed for 1,000 lbs. load rating.
- Double-sided #12-24 EIA universal mounting hole spacing with 24 #12-24 mounting screws included.
- Accepts all Panduit or Leviton cable management and patch panel products in addition to any industry standard 19" components or Canyons School approved equal.
- Includes paint piercing washers for assembly to assure electrical continuity between components as pert TIA 607-B Bonding and Grounding Standard.
- c. In telecommunications rooms with multi-bay rack rows configured such that patching will take place between racks, Contractor is responsible to include in design interbay routing pathways at the top, middle and bottom of each bay to provide efficient and neat interbay routing.
- d. Interbay routing shall be provided in the form of top troughs, interbay mid-rack path and flanged shelf at the bottom. (See "Illustration of Interbay Routing" below).



Illustration of Inter-bay Routing in Rack Systems



- e. For bottom-of-rack interbay routing where cable quantities exceed capacity of CMUT19 troughs, Contractor shall substitute 4RU trough CMLT19.
- f. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to TIA 607-B Bonding and Grounding Standard. See Bonding and Grounding section of this document for details.
- g. See Appendix A for part numbers.
- 3. Rack-mounted Cable Management Vertical Managers
 - a. Vertical cable managers shall be PatchRunner[™] high capacity vertical Cable management system in sizes 6" wide, 8" wide, 10" wide and 12" wide, Leviton vertical cable management systems or Canyons School approved equivalent.
 - b. Contractor will use double-sided (front and back) vertical managers on fronts of 4-post racks.
 - c. All vertical cable managers shall have metal dual hinged doors.

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- d. Contractor shall choose vertical cable manager width according to manufacturer's fill tables to not represent more than a 35% fill at installation based on projected worst-case density when racks are fully populated.
- e. Vertical cable managers shall have the following features:
 - High density minimizes area required for network layout, freeing up valuable floor space.
 - Allows mounting of many standard EIA 19" accessories, such as patch panels, vertically in the manager.
 - Ventilated sidewalls provide maximum airflow for equipment cooling.
 - Snap on finger sections can be removed to improve airflow, and breakaway fingers allow routing of large cable bundles.
 - Large finger spacing accommodates up to 48 Cat6A cables.
 - Optional sure-close dual hinged metal doors provide easy access to vertical pathway and provide visual and audible feedback on closure.
 - Available in 7-foot version.
- f. See Appendix A for part numbers.
- 4. Rack-mounted Cable Management Horizontal Managers
 - a. One-to-one switch patching strategy largely eliminates the need for horizontal cable managers, but there still may be instances requiring them. One example is in the network core where chassis switches are used.
 - b. For these areas requiring horizontal cable managers, Contractor shall user double-sided NetManager [™] high capacity horizontal cable managers, Leviton horizontal cable managers or Canyons approved equal having the following features:
 - Innovative inset fingers slope inward toward back of managers offering unobstructed access to network cabling for easier moves, adds, and changes.
 - Large front finger openings easily accommodate Category 6a and 10 G/b E cables, speeding installation and reducing maintenance costs.
 - Rear cable management finger spacing utilizes open D-rings for greater accessibility.
 - Can be used to create large capacity horizontal pathways for routing cable.
 - Patented front and rear dual hinged cover allows cable access without removing cover.
 - Curved surfaces maintain cable bend radius.
 - Pass-through holes allow for front to rear cabling.
 - Built in cable retainers hold cable in place for easy moves, adds, and changes.
 - Mount to 19" EIA racks and cabinets.

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- Covers, #12-24 and M6 mounting screws included.
- Design fits flush to the front of the NetRunner
 High Capacity WMPVHCF45E and WMPVHC45E Vertical Managers or Leviton vertical cable managers.
- c. See Appendix A for part numbers.

F. Cable Accessories

- 1. Cable Ties
 - a. Cable bundles on racks and in pathways shall be bundled with re-enterable hook and loop cable ties that come in continuous rolls.
 - b. Contractor is responsible for using plenum hook and loop ties in air-return spaces.
 - c. See Appendix A for part numbers.
- 2. Physical Security Devices
 - a. Some portions of Canyons School District networks require additional physical security devices. These take three forms:
 - b. Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
 - c. Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
 - d. Devices that temporarily or permanently block USB ports on laptops and computers.
 - e. Areas where such devices are required will be called out in the project documentation.
 - f. See Appendix A for part numbers.

G. Communications Grounding Network

- 1. General
 - a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.
- 2. Room Busbars
 - a. All Telecommunications spaces and distributor rooms shall have installed an appropriately sized wallmount busbar with BICSI hole spacing that bonds to the building bonding backbone.
 - b. See Appendix A for appropriate room telecommunications grounding busbar.
- 3. Rack and Equipment Grounding
 - a. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding

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them to the wall mounted busbars as described in the TIA 607-C standard.

- b. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
- c. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.
- d. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.
- e. Contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
- f. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.
- g. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy chaining) of racks is expressly forbidden and will not be accepted.
- h. Rack Bonding Conductors (RBC) may tap into an overhead or under floor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
- i. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets, these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.
- j. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.
- k. For examples of rack grounding, refer to the illustration below:

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END OF SUB-SECTION SECTION III

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Communications Entrance Facilities Н.

1. General

- a. All entrance facilities shall be installed, grounded and bonded per applicable building, fire and electrical codes
- b. A minimum of gty 1 (one) 4" metal conduit shall extend from the Canyons School District owned handhole/vault at the property line to the MDF.
- c. A minimum of gty 1 (one) 4" conduit (item b above) shall contain gty 3 (three) 1.25" innerduct from the handhole to the MDF.
- d. All innerduct shall contain a secured pull string/tape.

IV. Network Labeling

General Requirements

- 1. When labeling any Canyons School District Information Technologies network system, whether existing or new, Contractor shall always adhere to the following requirements:
 - a. Contractor shall, wherever possible pre-print labels using Panduit Easy-Mark software and laser jet printer, Leviton or Canyons approved equivalent.
 - b. The Panduit PanTher (LS8E) hand-held thermal transfer printer, Leviton or Canyons approved equivalent shall be used on site to print labels that were unanticipated, or that become damaged in application.
 - c. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.
 - d. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.
 - e. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
 - f. All label printing will be machine generated by either hand-held labeling systems or computer generated using programs and materials built specifically for communications labeling.
 - g. Hand written labels will not be accepted and must be remedied at Contractors expense.
 - h. Cabling system labels shall utilize materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.
 - i. Cable labels shall be self-laminating, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end.
 - Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device. j.
 - k. Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.

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- I. All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.
- m. Labels shall be legible and placed in a position that insures ease or visibility. Label type must be as listed in Appendix A Materials section at the end of this document.
- n. Conduit shall be marked indicating the identification of the cable within.
- o. All cabling added to existing "legacy" installations shall follow the labeling convention in place at that location.
- p. All labeling of installed cabling in new (greenfield) projects shall satisfy all requirements of TIA 606-B, or be modified as indicated in the project specific documentation.

END OF SUB-SECTION IV

V. Testing and Acceptance

A. General

- 1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.
- 2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.
- 3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.
- 4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the PANDUIT® Certification Plus or PanGen[™] System Warranty, Leviton/Berk-Tek Limited Lifetime Warranty, or Canyons School approved equal guidelines and best industry practice.
- 5. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

a. Copper Link Testing

- All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.
- 2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
- 3. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.

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4. For warranty purposes, Contractor shall perform the appropriate Permanent Link test. Channel Link testing is rendered void by the movement of patch cords and can be run but not used for final acceptance criteria.

b.Fiber Testing

- 1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3, or as spelled out in the project documentation.
- 2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.
- 3. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.
- 4. Backbone single-mode fiber cabling shall be tested at the 1310 and 1550 wavelengths in both directions.
- 5. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 standard, Method B.
- 6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link-loss testing with a power meter is required. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above.
- 7. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard. If the link loss requirements defined within the standard are in conflict with those referenced in the project documentation, Contractor shall immediately bring this to the attention of Information Technologies for resolution.

c.System Documentation

- 1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to Canyons Schools for approval. Documentation shall include the items detailed in the sub-sections below.
- 2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.
- 3. Contractor shall submit with drawings a diagram of each telecommunications room with indicating which cabling drops will terminate in which rooms (classrooms). This is both to give an idea of contractor cable plant design, as well as to facilitate future troubleshooting.

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- 4. At the request of the Information Technologies Engineer, the telecommunications contractor shall provide copies of the original test results in tester native format, not spreadsheet.
- 5. Information Technologies may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by Information Technologies, including a 100% re-test. This re-test shall be at no additional cost to the Canyons School District Information Technologies.

d.Test Results

- 1. Documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year).
- The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crewmember name(s). Documentation shall also include test equipment name, manufacturer, model number, serial number, software version and last factory calibration date.
- 3. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.
- 4. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- 5. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form.
- 6. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.
- 7. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
- 8. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.

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- 9. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The School District will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added.
- 10. These documents will be modified accordingly by the Telecommunications Contractor to denote as-built information as defined above and returned to the Canyons School District.
- 11. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.

END OF SUB-SECTION V



Appendix A – Materials List

Manufacturer	Part Number	Description		
		COPPER DISTRIBUTION		
General Cable	7141819	CAT6A GenSPEED ® 10 UTP plenum (CMP), 4-pair, UTP copper cable, 0.25 OD – blue		
General Cable	2131752E	25 pair, plenum rated, Category 5E cable – gray.		
General Cable	8136100	CAT6A GenSPEED® Outside Plant Cable		
Panduit	CJ6X88TGBL	Category 6A, RJ45, 8-position, 8-wire, 10 Gb/s UTP Mini-Com® universal jack module has TG-style termination – color black. For other standard colors, replace suffix "BL" with IW (Off White) with El (Electric Ivory), WH (White), AW (Arctic White), IG (International Gray), OR (Orange), RD (Red), BU (Blue), GR (Green), YL (Yellow), or VL (Violet). Canyons School District standardize on black unless otherwise indicated in project documentation. NOTE MODULAR PATCH PANELS MUST BE POPULATED WITH JACKS AS WELL AS STAINLESS FACEPLATES.		
Panduit	CMBBL-X	Mini-Com blank module to blank out open spaces (holes) on faceplates and patch panels. For colors other than black replace "BL" with IW (Off White) with EI (Electric Ivory), WH (White), or IG (International Gray).		
Panduit	CPPL24WBLY	24-port patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates. Contractor to populate black Cat 6 jacks as specified in this document.		
Panduit	CPPL48WBLY	48-port patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates. Contractor to populate with black Cat 6 jacks as specified in this document.		
Panduit	UTP28X**BU	Category 6A Performance, 28AWG, UTP patch cord. For lengths 1 to 50 feet (increments of one foot), replace ** with desired length in feet. For standard cable colors other than Off White, replace "BU" with color code: BL (Black), RD (Red), YL (Yellow), GR (Green), OR (Orange), GY (Gray), PK (Pink), or VL (Violet).		
Panduit	CFPSL4IWY	Single gang, plastic, sloped vertical faceplate accepts four Mini-Com _® Modules.		
Panduit	CFPSL6IWY	Double gang, plastic, sloped vertical faceplate accepts eight Mini-Com₀ Modules. For labels use		
Panduit	UICFPSE8IW-2G	Double-gang, plastic, sloped vertical faceplate holds up to eight Mini-Com _® Modules		
Panduit	CFPL4SY	Single gang, stainless steel vertical faceplate accepts four Mini-Com Modules. Bequires minimum 1.9" wide electrical box for proper mounting		
Panduit	CFPL8S-2GY	Double gang, stainless steel vertical faceplate accepts eight Mini-Com₀Modules.		
Panduit	P110KB1005Y	Panduit Pan-Punch 100 pair 110 block termination kits for 25pr 5E cable. Field terminated. Includes a base, 5-pair connector kit with five 5-pair connectors per row of 25 pairs, two label holders, and two white designation labels.		
		FIBER DISTRIBUTION SYSTEMS		
General Cable	BE0121ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM3 12 strand fiber cable.		
General Cable	BE0241ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM3 24 strand fiber cable.		
General Cable	BL0121ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM4 12 strand fiber cable. (Use OM4 for any telecom rooms that are further than 300M apart).		
General Cable	BL0241ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM4 12 strand fiber cable. (Use OM4 for any telecom rooms that are further than 300M apart).		
Panduit	FLCDMCXAQY	LC OptiCame 10Gig [™] 50/125µm Multimode Duplex Fiber Optic Connector for 900µm tight-buffered fiber installation.		
Panduit	FCE1U	Opticom® QuickNet [™] Rack Mount Fiber Enclosures, holds up to four QuickNet [™] Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 1.73"H x 17.60"W x 16.30"D (43.9mm x 447.0mm x 414.0mm).		

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	50501			
Panduit	FCE2U	Opticom® QuickNet [™] Rack Mount Fiber Enclosures, holds up to eight QuickNet [™] Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 3.48"H x 17.60"W x 16.30"D (88.4mm x 447.0mm x 414.0mm).		
Panduit	FAP6WAQDLC	LC 10Gig [™] FAP loaded with six LC 10Gig [™] Duplex Multimode Fiber Optic Adapters (Aqua) with phosphor bronze split sleeves.		
Panduit	FAPB	Blank fiber adapter panel – reserves space for future use.		
Panduit	FX2ERQNQNSNM***	OM4 push/pull LC jumper/patch cord. Riser rated. *** At end of part number is for length in meters. Comes in 1 M increments up to 20 meters, then in lengths of 20 M, 25 M, 30 M, and 35 M. Put length in the following (3 digit) format: 001 for 1 M, 020 for 20 M, etc.		
		RACKS AND CABLE MANAGERS		
Panduit	R4P	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 30.0"D (2134mm x 591mm x 762mm).		
Panduit	R4P36	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 36.0"D (2134mm x 591mm x 914mm).		
Panduit	R4P42	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 41.5"D (2134mm x 591mm x 1054mm). FOR TOP OF RACK INTERBAY ROUTING.		
Panduit	R4PWF	Top trough with waterfall for 4-post racks creates pathway above rack. Dimensions: 1.9"H x 26.1"W x 8.5"D (50mm x 662mm x 216mm).		
Panduit	R2P	19" EIA 2-post rack, aluminum. Dimensions: 84.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).		
Panduit	R2PPEVWF	Waterfall Trough for 2 Post Rack and PatchRunner high capacity		
Panduit	PEV6	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 6.0"W x 28.1"D(2120mm x 152mm x 714mm).		
Panduit	PED6	Dual hinged metal door. Dimensions: 82.8"H x 6.1"W x 1.7"D (2103mm x 155mm 43mm).		
Panduit	PEV8	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 8.0"W x 28.1"D (2120mm x 203mm x 714mm).		
Panduit	PED8	Dual hinged metal door. Dimensions: 82.8"H x 8.1"W x 1.7"D (2103mm x 206mm x 43mm).		
Panduit	PEV10	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 10.0"W x 28.1"D (2120mm x 254mm x 714mm).		
Panduit	PED10	Dual hinged metal door. Dimensions: 82.8"H x 10.1"W x 1.7"D (2103mm x 256mm x 43mm).		
Panduit	NM1	Horizontal Cable Manager High Capacity Front and Rear 1 Rack Unit. 1.7"H x 19.0"W x 13.1"D (44mm x 482mm x 332mm).		
Panduit	NMF1	Horizontal Cable Manager High Capacity Front Only 1 Rack Unit. 1.7"H x 19.0"W x 6.2"D (44mm x 482mm x 157mm).		
Panduit	NM2	Horizontal Cable Manager High Capacity Front and Rear 2 Rack Units. 3.5"H x 19.0"W x 13.1"D (88mm x 482mm x 332mm).		
Panduit	NMF2	Horizontal Cable Manager High Capacity Front Only 2 Rack Units. 3.5"H x 19.0"W x 6.2"D (88mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.		
Panduit	NMF3	Horizontal Cable Manager High Capacity Front Only 3 Rack Units. 5.2"H x 19.0"W x 6.2"D (133mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.		
Panduit	CMUT19	2 RU upper trough with 1.3" bend radius mounts to the top of a standard 19" EIA rack. Dimensions: 3.5."H x 19.0"W x 4.5"D (89mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY.		
Panduit	CMLT19	4 RU lower trough with 1.3" bend radius mounts to the bottom of a standard 19" EIA rack. Dimensions: 8.0"H x 19.0"W x 4.5"D (203mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY. LARGER OPTION THAN CMUT19 IF NEEDED.		
		CABLE PATHWAYS		
Panduit	J-Pro J-Hook system	Panduit J-Pro System. Plenum rated composite J-hooks with hardware available for various hardware applications.		
B-line	WB400	B-line basket tray.		

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Panduit	LD10IW10-A	LD10 International White Plastic Raceway, see catalog or <u>www.panduit.com</u> for fittings. For 8' sections order LD10IW18-A.		
Panduit	LD2P10	Dual Power/Data Raceway channel plastic raceway for concurrently running power and data. See catalog or <u>www.panduit.com</u> for fittings.		
Panduit	JBX3510IW-A	Single gang two-piece snap together outlet box with adhesive backing. Box accepts Pan-Way [®] Screw-On Faceplates or any NEMA standard single gang faceplate. For use with Pan-Way [®] T45 or LD profile raceway. 5.00"L x 3.26"W x 1.62"H (127.1mm x 82.7mm x 41.1mm). Breakouts for 1/2", 3/4", or 1" diameter conduit.		
Panduit	JBP2IW	Double gang two-piece screw together outlet box. Box accepts Pan-Way ⊚Screw- On Faceplates or any NEMA standard double gang faceplates. For use with Pan- Way ⊚LD profile raceway. 5.05"L x 5.05"W x 1.62"H (128.2mm x 128.2mm x 41.1mm). Breakouts for 1/2" or 3/4" diameter conduit.		
Panduit	T70BIW10	Panduit T-70 dual channel plastic raceway for concurrently running power and data in computer labs. See catalog or <u>www.panduit.com</u> for partitions and fittings. For 8 foot sections replace "10" in part number with "8".		
Panduit	T70CIW10	Cover for T-70 dual channel raceway. For 8 foot sections replace "10" in part number with "8".		
		BONDING AND GROUNDING		
Panduit	ACG24K	#6 AWG (16mm ₂) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.		
Panduit	LCC series	Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.		
Panduit	HTCT series	Panduit HTAPs. Must be selected according AWG size of run and tap conductors.		
Panduit	CLRCVR series	Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.		
Panduit	RGS134-1Y	Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm)thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.		
Panduit	RGCBNJ660P22	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm ²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10- 32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* for connecting to a #6 to #2 awg sized bonding backbone.		
Panduit	GJ672UH	Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72" long. For other lengths replace the "72" in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.		
Panduit	RGESD2-1	Two-hole ESD port with 5/8" hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread- forming screws. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH WRIST STRAP RGESDWS.		
Panduit	RGESDWS	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH ESD PORT RGESD2-1.		
Panduit	RGTBSG-C	Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).		
Panduit	RGEJ1024PHY	24" long pre-terminated equipment grounding jumper #10 AWG (6mm ²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).		
Panduit	RGEJ1036PFY	36" long pre-terminated equipment grounding jumper#10 AWG (6mm ²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).		

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Panduit	GB2B0306TPI-1	Wall mounted telecommunications busbar suitable for small telecom room. Pre- assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 12" in size.		
Panduit	GB2B0514TPI-1	Wall mounted telecommunications busbar suitable for med telecom room. Pre- assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 24" in size.		
Panduit	GB4B0624TPI-1	Wall mounted telecommunications busbar suitable for main grounding busbar in medium sized facility. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 4" x 20" in size.		
Panduit	LTYK	Wall mounted busbar label kit. Label kit includes printed tag and one flame retardant cable tie.		
		NETWORK LABELING SOFTWARE – FOR INK JET/LASER PRINTER		
Panduit	PROG-EM2GO	Easy-Mark Labeling Software for PC, supplied on USB Flash Drive. For preprinting communications labels on laser/inkjet printer.		
Panduit	S100X150YAJ	Self-laminating cable labels for Category 6 cable for use with Easy-Mark software and laser/ink jet printer.		
Panduit	C261X035Y1J	Patch Panel labels for use with Easy-Mark software and laser/ink jet printer.		
Panduit	C195X040Y1J	Faceplate labels for single gang stainless or sloped plastic - use with Easy-Mark software and laser/ink jet printer.		
Panduit	C288X040Y1J	Faceplate labels for double gang stainless - use with Easy-Mark software and laser/ink jet printer.		
Panduit	S100X650YAJ	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with Easy-Mark software and ink jet printer.		
Panduit	S100X160YAJ and NWSLC-3Y	Label and turn-tell sleeve for labeling fiber jumpers. For use with Easy-Mark software and ink jet printer.		
Panduit	C200X100FJJ	1" high, white, vinyl tape labels for labeling grounding busbars, racks, cabinets and pathways. For use with laser/ink jet printer.		
		NETWORK LABELING – HANDHELD LABELER		
Panduit	LS8EQ-KIT-ACS	Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator's manual. USE FOR LABELS THAT MUST BE PRINTED ON THE JOB SITE.		
Panduit	S100X150VAC	Self-laminating cable labels for Category 6 cable for use with PanTher LS8E hand- held printer.		
Panduit	C261X035Y1C	Handheld printer labels for modular faceplate patch panels.		
Panduit	C195X040Y1C	Faceplate labels for single gang stainless - use with PanTher handheld labeler.		
Panduit	C288X040Y1C	Faceplate labels for double gang stainless - use with PanTher handheld labeler.		
Panduit	S100X650VAC	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with handheld labeler.		
Panduit	S100X160VAC and NWSLC-3Y	Label and turn-tell sleeve for labeling fiber jumpers. For use with hand-held labeler.		
Panduit	Т100Х000VPC-ВК	1" high, continuous black on white, vinyl tape labels for labeling racks, cabinets and pathways with PanTher LS8E handheld labeler.		
		PHYSICAL SECURITY LOCKING DEVICES		
Panduit	PSL-DCJB-C	Package of 100 RJ45 jack blockout devices and one removal tool. Color red.		
Panduit	PSL-USBA-L	Package of 50 USB Type 'A' blockout devices and one removal tool. Color red.		
Panduit	PSL-USBB-L	Package of 50 USB Type 'B' blockout devices and one removal tool. Color red.		
Panduit	PSL-DCPLX-BL-C	Package of 100 RJ45 plug lock-in devices compatible with flush mount jacks, and one installation/removal tool. Color black.		

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Panduit	PSL-DCPLRX-BL-C	Package of 100 RJ45 plug lock-in devices compatible with recessed jacks, and one installation/removal tool. Color black.	
		CABLE TIES – HOOK AND LOOP	
Panduit	TTS-35RX0	.75" wide, continuous roll Hook and Loop Cable Ties, black. 35 ft roll. Carton qty 10 rolls.	
Panduit	HLSP1.5S-X12	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6" length.	
Panduit	HLSP3S-X12	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6" length.	

<END OF APPENDIX A>

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DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

- 28 0501 COMMON REQUIREMENTS FOR ACCESS CONTROL AND VIDEO SURVEILLANCE
- 28 2205 ACCESS CONTROL SYSTEM
- 28 2300 IP VIDEO SURVEILLANCE SYSTEM

SECTION 28 0501 - COMMON REQUIREMENTS FOR ACCESS CONTROL AND VIDEO SURVEILLANCE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical, Electrical and other applicable documents are considered a part of the security documents insofar as they apply as if referred to in full. Contractors must review the entire set of plans and specifications. Reviewing only the security set is not acceptable.
- C. Division 26, 27 & 28 basic materials and methods sections apply to work specified in this section, including but not limited to for requirements for raceways, trays, boxes, and fittings, and supporting devices, and other sections, as applicable.
- D. Refer to specification 26 0553 Electrical Identification for cabling, conduit, and junction box color requirements.
- E. Refer to specification 27 1500 Telephone Data Systems for category and/or optical fiber cable, connectivity specifications, additional pathway requirements, and installation standards.
- F. This specification does not address other Division 28 sections, such as the Nurse Call System and/or Fire Alarm and Detection Systems.

1.2 ENGINEER CONTACT INFORMATION:

- A. BNA Security Contact(s):
 - 1. Drayton Bailey Phone: 801-532-2196 Email: <u>Drayton@BNAConsulting.com</u>
 - 2. Dan Varney Phone: 801-532-2196 Email: DVarney@BNAConsulting.com

1.3 DESCRIPTION OF WORK:

- A. Security work is defined as any Division 28 system specified, including but not limited to access control and video surveillance systems.
- B. The extent of security work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision, and service necessary for complete and working systems.
- C. Provide the specified systems in a complete and operating condition with all necessary materials and labor to fulfill the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components. Contractor shall provide all cables, materials, and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
- D. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports, and plenum space requirements. Contractor shall provide plenum rated cabling if required per the mechanical drawings.
- E. Contractor shall provide ³/₄" EMT conduit from devices to accessible ceiling space, then utilize non-continuous cable support devices (J-Hooks) to head-end equipment, utilizing cable tray if on project.

- F. All raceways and enclosures shall be securely fastened and/or mounted as per the currently adopted version of the National Electrical Code (NFPA 70). All work must be completed in a neat and workmanlike manner.
- 1.4 BID SUBMITTAL:
 - A. Provide a detailed scope of work document for all services provided.
 - B. The contractor is required to furnish a comprehensive bill of materials encompassing all components, accessories, and hardware essential for the assembly of a complete and fully functional system, as specified within the contract documents. The bill of materials must detail each item with clarity, including quantities, specifications, and any pertinent details necessary for system integration. Compliance with contract specifications and industry standards is imperative.
 - C. Provide a breakout cost of material and labor as different line items. Bids must include lineitem pricing for major parts and components of the system.
 - D. Submit manufacturer certifications for all systems provided. Certifications must be from the local office providing the installation.
 - E. All permitting costs shall be included in base bid.
 - F. All equipment shall be installed as shown on the drawings and in strict accordance with the specifications. Any errors, conflicts, or omissions discovered in the specifications, or drawings, shall be submitted in writing to the Security Consultant for clarification in an RFI prior to bid.

1.5 QUALITY ASSURANCE:

- A. MANUFACTURERS: Firms regularly engaged in manufacture of security system equipment and components of the types described here in and whose products have been in satisfactory use in similar applications for not less than 5 years.
- B. Integrating firm shall have worked satisfactorily for a minimum of (5) years of completing systems equal to this scope, quality, type, and complexity.
 - 1. Key personnel assigned to the project shall each have a minimum of (5) years of experience in completing systems equal to this scope, quality, type, and complexity.
 - 2. Contractor shall be a factory authorized installer of all equipment specified for the geographical area of the project.
 - 3. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
 - 4. Contractors shall have current manufacturer certifications for all security systems and equipment listed within this specification. Certifications must be from local office providing the installation.
- C. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- D. All technicians are required to have proper state licensing to perform work within this specification.
- E. List of qualifications include:
 - 1. Industries certifications including manufacturers.
 - 2. Past and current projects within the last 5 years are similar in scope and size.
 - 3. (3) Different referrals from the owners of (3) different projects within the last 5 years.

1.6 GENERAL COORDINATION:

- A. Meet with Electrical Contractor prior to pathway rough-in to coordinate system requirements in each area and review each security device that requires 120V power.
- B. Meet with Owner's IT Department prior to ordering equipment to coordinate IT services to equipment.
- C. Meet with Low Voltage Cabling Contractor (Division 27 1500) at least once, prior to roughin, to verify all category cabling needs to equipment.
- D. Regular inspections are required and shall be scheduled by the contractor through the Owner/Architect at least twenty-four hours in advance.
- E. Coordinate color and finish of all components with Architect.
- F. Notify engineer of any modifications between contract documents and submittals. It is the contractor's responsibility to ensure compliance with the documents.
- G. Contractor's Project Manager will be required to schedule and provide weekly updates via remote meeting and/or email communications on progress of installation and update project schedule if any dates change from original completion.
- 1.7 SUBMITTALS:
 - A. Refer to specification 26 0502 "Electrical Submittals and Spare Parts" for submittal requirements.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide complete raceway system for security system including but not limited to, raceway, outlets, cover plates, backboards, cabinets, grounding and miscellaneous items as required.
- B. Provide plywood terminal backboards, 4' x 8' x ³/₄" unless otherwise noted for all security equipment unless otherwise noted to be installed in racks.

PART 3 – EXECUTION:

3.1 GENERAL REQUIREMENTS

- A. Provide and install proper finger wire duct with covers within each panel per project requirements. Provide and install Velcro to neatly bundle cables. All cabling shall be installed in a neat and workmanlike manner.
- B. Install systems as indicated, in accordance with equipment manufacturers' written instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with NEC requirements and applicable portions of NECA's "Standards of Installation" practices.
- C. Coordinate all equipment locations and mounting details with other trades and suppliers.
- D. Provide at least one duplex receptacle on dedicated power circuit next to specified panels.
- E. Grounding: Provide grounding connections sufficiently tight to assure permanent and effective ground.
- F. Conceal raceways and conduits unless otherwise noted in specifications and drawings. Where exposed raceways are permitted, run parallel/perpendicular to walls.

PART 4 – TESTING:

- 4.1 GENERAL REQUIREMENTS:
 - A. Testing: Upon completion of installation of system and after energized, demonstrate

system compliance with intent.

B. Coordinate final inspection of the systems installed, with Security Consultant, three (3) weeks in advance.

PART 5 - LABELING & TRAINING

5.1 GENERAL REQUIREMENTS:

- A. The contractor shall develop and submit for approval a labeling system for the device and cable installation. Coordinate with the owner and negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels, and wall plates. The labeling system shall designate the cables' origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- B. All labels shall meet UL 969 requirements for legibility, defacement, and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size, and color.

5.2 TRAINING:

- A. Provide two training sessions that consist of two hours each of training on the operation of each system, at job site, at no cost to owner. Systems shall be complete and have been finalized by the Consultant prior to training.
- B. The security contractor will terminate, program and test control equipment. As built drawing package (refer to specification 26 0502 "Electrical Submittals and Spare Parts" for as-built drawing package requirements) shall be provided to Owner personnel before commissioning shall begin. System loops will be tested, and any fault conditions found shall be corrected immediately by the contractor.

5.3 CYBERSECURITY

- A. Contractor shall change all default usernames and passwords for all network devices provided. A Strong Password should -
 - 1. Be at least 8 characters in length.
 - 2. Contain both upper and lowercase alphabetic characters (e.g., A-Z, a-z)
 - 3. Have at least one numerical character (e.g., 0-9)
 - 4. Have at least one special character (e.g., ~! @#\$%^&*()_-+=)
- B. No written username or passwords shall be located in any areas of installation, except in the O&M manual.
- C. Network devices to be set up on a separate network other than owner's LAN ensuring no internal or external users can access system without authorization. Follow manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.

5.4 WARRANTY AND SERVICE:

- A. The minimum warranty period shall be one year, the warranty period will begin when the system completion documents are submitted to the owners and the system has successfully passed all tests and inspections. Included in the completion documents will be a warranty and service contact form, this form will be filled out by the burglar alarm contractor, all necessary contact information shall be included to guarantee a response to the system site within 24 HOURS OF THE REQUEST FOR SYSTEM SERVICE. Only qualified technicians capable of making needed repairs and/or system programming are accepted to respond for service.
- B. Contractor shall honor equipment warranties for term established by manufacturer if greater than warranty time frame mentioned above.

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Commented [GU1]: Reference to O &M Manual requirements in Submittal Section

- C. During warranty time period:
 - 1. Systems designed for 24/7 operation shall be repaired and/or replaced within 24 hours of time of notification. If defective components cannot be repaired in time, provide temporary equipment as required.
 - 2. During warranty time period, upon owner request, the contractor shall provide programming changes up to (4) four times or 4 hours free of charge.

END OF SECTION 28 0501

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SECTION 28 2205 - ACCESS CONTROL SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Refer to Division 8 for the door hardware schedule and requirements.
- C. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- D. Division 28 0501 Common Work Results for Electronic Safety & Security, apply to this section.
- 1.2 DESCRIPTION OF WORK:
 - A. Provide a complete and operating access control system as indicated in the drawings and specifications, and is hereby defined to include, but not be limited to: access control server, control panels, reader boards, power supplies, visitor management system, credential card readers, badge printers, credentials/cards, raceway, outlets, cover plates, jacks, backboards, cabinets, grounding, video surveillance integration, intrusion detection integration, intercom integration, protective enclosures, and all required wiring. Contractor shall furnish all cables, materials, and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
 - B. Provide all necessary materials and labor to fulfill all the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components.
 - C. Contractor is responsible for coordinating with the Division 8 door hardware contractor to review the door hardware specification and ensure all components requiring a connection are installed.
 - D. Program the access control system that upon activation of an emergency lockdown, or preventative lockdown, a command from the administrative console, web browser, or app a communication protocol will be sent for all, or partial controlled doors, to be locked / unlocked.
 - E. Equipment lists are provided to set equipment expectations and may not be complete. Coordinate with devices shown on drawings for system intent. Provide a complete and functional system as described within the construction documents.

1.3 COORDINATION (ACCESS CONTROL SPECIFIC):

- A. Coordinate with Owner, Division 8 contractor, and Division 26 contractor PRIOR to rough-in to coordinate exact location and rough-in of end devices and door functionality. Carefully review Division 8 package (including door hardware schedule and specification) prior to bid and include all components requiring a connection by Division 26/28. Meet with Division 8 post-bid and prior to purchase of any equipment. It is not the Security Engineer's responsibility to complete the coordination between Division 8 and Division 26/28 for exact locations, connections, and rough-in.
- B. All door hardware specified shall be reviewed upon award of the bid and before ordering any equipment.
- C. During construction, each location showing equipment shall be walked by the contractor and any discrepancies on door hardware fit, finish, and function shall be brought to the architect and security engineer's attention immediately. It is the contractor's responsibility to provide a complete and functioning system and door opening.

- D. Division 26, 27, and 28 contractors shall verify electrical service provided prior to ordering any electrical equipment serving electronic door hardware equipment and has the final responsibility for properly coordinating the electrical work, including the exact location of the electrical connection(s).
- E. Obtain submittals of all door hardware equipment from door hardware specification and Division 8 and 28 contractor(s). Carefully review door hardware submittal and advise in writing of any discrepancies.
- F. The contractor shall include necessary wiring and programming for fire-alarm panel tie-in and door release. Contractor is responsible to schedule and coordinate with the fire alarm contractor. It is the responsibility of the Contractor to review the Division 8 package (specifications and door hardware schedule) to confirm which doors require fire alarm release.
- G. Coordinate all interfaces between door hardware and electrical contractor, including any additional panel interface modules and licensing to provide interface between PoE/wireless electronic locks.
- H. Provide a dedicated 20-amp circuit for access control panel equipment.
- 1.4 QUALITY ASSURANCE:
 - A. Manufacturer Certified & State Licensed Contractor(s):
 - 1. Lenel / OnGuard
 - i. Stone Security
 - ii. Security 101
 - B. Bidders not pre-approved: See Division 28 0501 Part 1.5.

PART 2 – PRODUCTS

- 2.1 GENERAL REQUIRMENTS:
 - A. Provide a complete and operable open platform / mercury-based access control system that meets the owner's requirements, operates to the manufacturer specifications, and maintains building security.
 - B. The network appliance shall be able to run on an existing TCP/IP network and accessible, configurable, and manageable from any network-connected PC with a browser and/or client.
- 2.2 GENERAL EQUIPMENT REQUIREMENTS:
 - A. Provide all necessary equipment to ensure a complete access control system is achieved. Provide the following equipment as a baseline for the access control system:
 - 1. Access Control Head-End Equipment/Panels

Description	<u>Manufacturer</u>	Part Number
Access Control Server	-	Owner Provided
Intelligent Dual Reader Controller	Lenel	LNL-X2220
Intelligent Single Door Controller	Lenel	LNL-X2210
Intelligent System Controller	Lenel	LNL-X3300
Advanced Dual Reader Controller	Lenel	LNL-X4420
Output Control Module	Lenel	LNL-1200
Dual Reader Interface Module	Lenel	LNL-1320-S3
Single Reader Interface Module	Lenel	LNL-1300

Input Control Module	Lenel		LNL-1100
4 Door Power Supply ACS Enclosure 8 Door Power Supply ACS Enclosure 16 Door Power Supply ACS Enclosure	LifeSafety Power LifeSafety Power LifeSafety Power		FPO75-B100C4D8PE2M FPO150-B100C8D8PE4M1 FPO150/250-2C82D8PE8M2
Rechargeable Sealed Back-Up Battery	Yuasa, Power S	UltraTech Sonic, Elk	12V 8Ah
2. End Devices			
Credential Card Readers Signo 40-Standard Wall Reader Signo 20-Mullion Style Reader Signo 40K-Standard Wall Reader w/Key Signo 20K-Mullion Style Reader w/Keyp USB Enrollment Reader Door Position Switch/Contact	vpad ad	HID Global HID Global HID Global HID Global RF IDEAS Bosch	40NKS-02-000000 20NKS-02-000000 40KNKS-02-000000 20KNKS-02-000000 RDR-80081AKU (or equivalent) ISN-CSD70 (or equivalent)
Request to Exit Motion Trim Plate *A motion request to exit should only be used available	d where a	Bosch Bosch an integrated request to exi	DS160 (or equivalent) TS160 (if applicable) t (in the electrified lock) is not
Momentary Door Release Button		Alarm Controls	TS-18 (or equivalent)
Duress / Panic Button		Honeywell	269R (or equivalent)

Push To Exit Button	Securitron	EEB (or equivalent)
	Coodina on	

- B. Equipment lists are provided to set equipment expectations and may not be complete. Coordinate with devices shown on drawings, system risers and equipment list for system intent. Provide a complete and functional system as described within the construction documents.
 - 1. DIV.28 to provide and install all integrated credential card reader / electrified lockset combinations.
 - 2. DIV.28 shall provide all the power supplies for electrified door hardware equipment. Coordinate & verify with DIV.8 for the exact power requirements.
 - 3. Coordinate, discuss, and verify with the architect, owner, and electrical contractor the door hardware that is going to be provided & installed.
 - 4. Provide 1 year of software updates for access control software.

2.3 POWER SUPPLIES:

- A. The DC voltage power supply shall provide dual output fused ports of either 12 or 24 VDC and receive its power input from 120VAC. Units shall be expandable by adding additional modules for up to three power modules. Power modules shall provide power capabilities from 75 to 250W. The system shall provide configurations for power distribution, control & signaling, fire alarm interface, fail safe/fail secure locking control, and shall be a standard feature of the system.
- B. Provide all access control panels and electrified door hardware power supplies with 12V sealed lead rechargeable backup batteries that will provide minimum standby power capacity for 24 hours.

- C. Provide a category cable as required to each device for remote functionality such as control, status reporting, information logging, remote battery testing, fault reporting / restore, and shall interface with multiple control and monitoring modules to extend the remote functionality to multiple individual outputs for direct control, extended information gathering and reporting.
- D. It is the Division 28 contractor's responsibility to provide power supplies for all electric locks, access control panels, and any other access control devices, to provide a complete & functional ACS system.
- 2.4 CREDENTIAL CARD READERS:
 - A. Connect contactless smart card reader with pigtail cable.
 - B. Tamper detection on card readers shall be programmed to send notification through access control system in the event of damage or tampering.
 - C. The credential card reader must support mobile phone credentials.
 - D. Mount card readers on a 4 square j-box with a single gang mud ring. Do not provide a back box for mullion style card; route wiring though mullion/door frame.

PART 3 – EXECUTION

- 3.1 INSTALLATION OF ACCESS CONTROL SYSTEM:
 - A. GENERAL: Install the access control system as indicated, in accordance with the equipment manufacturer's specifications, written instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with the requirements of NEC, and applicable portions of NECA's "Standards of Installation" practices.
 - B. Prior to starting any work, coordinate and verify the access control layout, wiring, equipment device locations, and mounting details with the owner, architect, and any other trades and suppliers that are applicable, and get written approval.
 - C. COORDINATION MEETINGS:
 - 1. Meet at least twice with the door hardware systems installer. Hold the first meeting before the submittal of shop drawings to coordinate electronic door hardware components for each door, rough-in requirements, and door schedules. Hold the second meeting before the physical installation of components to verify raceway and cabling, equipment list, any changes have been accounted for, and site conditions for each area.
 - 2. Review and coordinate access control system layout and wiring with owner.
 - D. NETWORK DEVICES: Provide network cable(s) to any networked devices for access control system and coordinate terminations.
 - E. Grounding: Provide grounding connections sufficiently tight to assure permanent and effective ground.
 - F. Testing: Upon completion of installation of system and after energized, demonstrate system compliance with intent.
 - G. WIRING & TERMINATIONS: All components of this system will need to be in accordance with the manufacture's specifications & recommendations. All final connections shall be made by a qualified & certified technician familiar with the manufacture's equipment and adhering to the owner's procedures.
 - H. ON-SITE EQUIPMENT: The contractor shall provide their own installation equipment unless they have written permission from the owner to use any of the owner's equipment (lifts, ladders, tools, etc.) onsite. It is the contractor's responsibility to provide all labor and equipment costs in their proposals.

- I. ZONING: Each detector, door position switch, and sensing device shall be considered a location. Multiple doors at a common entry can be considered one location. The system shall be programmed to log and detect individual status of a monitored door based on a schedule. Doors with a door contact must have the ability to receive alerts for that specific opening if the door is opened during a certain time and/or left open for a specific time (60 seconds).
- J. LABELING: The contractor shall develop and submit for approval a labeling system for the cable installation. Coordinate with the owner and negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels, and wall plates. The labeling system shall designate the cable's origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
 - 1. All labels shall meet UL 969 requirements for legibility, defacement, and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size, and color.
 - 2. Provide laminated plans (minimum size 11x17) of all Security Systems as-built plans (including riser diagrams) at each telecom room/panel location.
- K. Occupancy Adjustments: When required within one year of date of substantial completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide 1 visit to the site for this purpose without additional cost.
- L. Mounting Height: Credential card readers and intercoms should meet all ADA mounting requirements. Card readers shall be mounted 48" from the floor to the top of the card reader.
- M. Roof Access Hatch/Door: Verify each roof access hatch/door location with the owner and install a door position contact on each one. Each roof hatch door position contact shall be tied into the access control system, and into the intrusion detection system that will provide a scheduled notification when opened.
- N. Request to Exit Motions: Prior to installation coordinate with the owner the location of the request to exit motions above the door.
- O. Provide all relays required to tie access control system into fire alarm system.
- P. ADA OPERATION: The security contractor is responsible for integrating access control and ADA operators. coordinate with the owner, Division 8 and 26 contractors to for operation and functionality.
 - 1. ADA Door Opener/Actuator: Provide connection to door opener/actuator to access control system. Program credential card reader and ADA operator per IBC requirements. Provide all necessary cabling, relays, and equipment from the ADA operators and actuators to tie into access control system. Program credential card reader and ADA operator to operate per the Owner's requirements. At a minimum, the ADA actuator shall be disabled during lockout and closure periods.

3.2 WIRING:

- A. Pathway Requirements:
 - 1. See specification 28 0501 for requirements.
- B. Cabling:
 - 1. See specification 27-1500 for category cable requirements.
 - 2. All Security cable outer jacketing shall be Yellow; UL Listed; and CMP rated.
 - 3. Access Control Cabling:

- a. Provide the following cable from the ACS head-end panel(s) to the junction box located above each door that has access control door hardware equipment installed:
 - Access Control Composite Cable: Windy City Wire (or equivalent manufacture), UL Listed, Plenum Rated (if applicable) #4461030-OSDP.
- b. Provide the following cable from each card reader device up to the j-box that is located on the secure side of the door in accessible ceiling space:
 - Credential Card Reader (CR): 22/1P OAS Lo-Cap, RS-485, 120 Ohms + 18-02 Twisted Non-Shielded, Jacketed, UL listed, Stranded, & CMP rated (OSDP)
- 4. Request for Exit Motion (REX): 4/C, 22 AWG, Stranded, CMP, UL listed.
- 5. Electrified Door Hardware Equipment: 4/C, 18AWG, Stranded, CMP rated, UL listed.
- 6. Door Position Switch (DPS): 2/C, 22 AWG, Stranded, CMP rated, UL listed.
- 7. Panic / Duress Button, Push to Exit, Momentary Door Release Button: 4/C, 18 AWG, Stranded, CMP Rated, & UL Listed.
- 8. Wiring by Divisions 26: The electrical connections/terminations for certain equipment provided under door hardware divisions has not been specifically indicated on the electrical drawings and must be provided by and field coordinated by the door hardware trade requiring such electrical connections. Electrical contractors shall review architectural drawing, and door hardware specifications and coordinate with said contractors to confirm electrical needs.

3.3 SYSTEM CONFIGURATION, PROGRAMMING AND COMMISSIONING

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- A. Configure the system for full operation. Include owner in the process as much as feasible to understand their intended operation and insure full transfer of operations to them.
- B. Provide a fully commissioned system to ensure the entire system is operating as intended and in accordance with Owner's policy. Label cables on both ends in all boxes, panels, and racks according to Owner standards.
- C. The contractor shall include in the base contract all costs required to program lockdown procedures based on the owner's requirements and direction.
- D. The contractor shall include necessary programming for fire-alarm panel tie-in and door release based upon the requirements and direction of the owner and/or AHJ.
- E. Contractor shall input database of all required card holders and desired schedules for users and/or groups. It is the contractor's responsibility to coordinate with the owner on which card holders have access to which openings.

END OF SECTION 28 2205

SECTION 28 2300 - IP VIDEO SURVEILLANCE SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Division 28 0501 Common Work Results for Electronic Safety & Security, apply to this section.

1.2 DESCRIPTION OF WORK:

A. Provide a complete and operating IP camera video surveillance system as indicated in the drawings and plans, and is hereby defined to include, but not be limited to: IP cameras, mounting hardware, IP licenses, network video recorder, workstations, monitor, keyboard & mouse, power supplies, jacks, input plates, patch panels, PoE switches, routers, network switches, equipment racks, patch panels, connectors, mobile clients, access control integration, intrusion detection integration, intercom integration, protective enclosures, and all wiring that is normally and reasonably required.

1.3 COORDINATION:

- A. Contractor shall coordinate color and finish of all camera components with architect or electrical contractor as appropriate. Provide black camera finishes for all cameras in locations surrounded by dark finishes, whether wall-mounted or ceiling mounted.
- 1.4 QUALITY ASSURANCE:
 - A. Pre-Approved Installation Contractor:
 - 1. Stone Security
 - 2. Utah Yamas Controls
 - 3. Security 101
 - B. Bidders not pre-approved: See Division 28 0501 Part 1.5.B.

PART 2 - PRODUCTS

- 2.1 GENERAL REQUIREMENTS:
 - A. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser and/or client.
- 2.2 AUTHORIZED EQUIPMENT MANUFACTURE(S):
 - A. (VMS) Authorized Video Management Software Manufacturer(s):
 - 1. Milestone
 - B. Authorized IP Surveillance Camera Manufacture:
 - 1. AXIS Communications (#P3265-LVE / 02333-001)

2.3 Camera Requirements

- 1. The camera shall be fully supported by the VMS manufacturer.
- 2. All cameras are denoted by subscript on plans and shall be PoE or PoE+.
- 3. Exterior cameras shall have weatherproof enclosures regardless of location. They may be either dome or other environmental housing which suits the general appearance of the facility. The camera housing will entirely enclose all of the wiring, and the cameras are to be tamper proof.
- 4. Provide each IP surveillance camera with one 64GB micro SDXC memory card.
- 5. Exterior and interior IP surveillance cameras category transmission lines must protect against lightning and other related power surges with in-line surge protectors.
- 6. Coordinate all camera locations, wiring, and rough-in requirements with owner and supplier prior to rough-in.
- 7. The camera shall be equipped with (1) 100BASE-TX Fast Ethernet port or faster, using a standard RJ-45 socket and shall support auto negotiation of network speed (100 Mbps and 10 Mbps) and transfer mode (full and half duplex)
- 8. Provide camera types and quantities as indicated on the associated drawings.
- 2.4 Network Video Recorder (NVR)
 - A. Rack-mounted server shall be designed and built to project specifications that comply with recording and data processing requirements the manufacturer recommends.
 - B. NVR Minimum Requirements:
 - 1. Days of Storage: 30
 - 2. Number of Cameras: Per Project.
 - 3. Frames Per Second (FPS):
 - a. Continuously Recording for 1FPS.
 - b. Recording Motion at 15FPS.
 - 4. Motion Recording Percentage: 40%.
 - 5. Daily Hours of Operation: 24.
 - 6. Resolution: Per Each Camera.
 - 7. Compression: H.264.
 - 8. Image Complexity: Medium.
 - 9. RAID Requirement: Hot Swappable Drives with RAID 5.
 - C. The computers operating system (OS) and VMS software shall be on a separate hard drive than the video storage recordings.
 - D. Provide a minimum of two Network Interface Cards (NIC) and support connection to the cameras on a network separate from the Client Viewer, Management Server, and System Manager.
 - E. The Recording Server shall have the ability to accept the full frame rate supplied by the cameras, while recording a lower frame rate, yet still make the higher frame rate available to the Clients for live viewing.
 - F. The computer and networking equipment must be protected from power spikes and brief power failures by an Uninterrupted Power Supply (UPS). Provide a UPS with 15 minutes of runtime at half load and rack mountable.
 - G. Provide one 19" LCD monitor, and one wireless keyboard & mouse, or, one short depth rackmount LCD monitor with keyboard drawer.

- 2.5 Video Management System (VMS)
 - A. Provide video management software to include all camera licensing fees and software upgrade agreements for a minimum of 1 year. Install and configure all software on the network video recorder and workstations as required for owner use. Install and configure all software on up to 3 owner provided workstations as required for owner use.
 - B. Provide video management software to include all camera licensing fees and software upgrade agreements for a minimum of 1 year. Install and configure all software on the network video recorder and workstations as required for owner use.
 - C. Setup motion masking on any outside trees or non-critical areas. (Verify with owner or consultant)
 - D. Set-up any user required privacy masking for personal areas information sensitive areas.
 - E. Contractor to set-up VMS mapping feature to show locations of cameras.
 - F. Contractor shall set up desired views and layouts of per owners' specifications.
 - G. Cameras to be set at 15 FPS when motion is detected and record 1 FPS continuously.
 - H. Adjust motion recording and compression to optimize storage.
 - I. Contractor to ensure all software is on the latest firmware and version of video management software.
 - J. If any analytics are specified on the project, install and program any specified analytics and optimize for cameras environment.
 - K. Name all cameras and views per owner's requirements.
 - L. The system shall allow archiving to be enabled on a per camera basis and allow the user to define which archiving drive shall be used for each camera. The Hard Disk Drive storing the Archive Database.

2.6 WIRING / CABLING, AND PATHWAYS:

A. See Specification 27 1500 Telephone Data Systems for cabling and 28 0500 for pathway requirements.

PART 3 – EXECUTION

3.1 INSTALLATION OF IP VIDEO / CAMERA SURVEILLANCE SYSTEMS:

- A. Install all IP cameras at locations shown on drawings and after conducting a walk-through with the owner to verify exact locations. Install NVR and all power equipment to provide a fully functional system.
- B. Coordinate all cabling work, patch cabling and labeling with owner.
- C. Contractor shall configure camera frame rates, resolutions, and IP addressing of cameras.
- D. Contractor shall be responsible for coordinating work with owner and the IT staff to coordinate devices on network specific to the video surveillance system.
- E. Contractor shall verify all mounting heights/locations to ensure ideal views for each camera. Typical mounting height to be 9-12' unless noted in plans.
- F. Provide one specified category network cable that home runs back to the designated equipment rack.

3.2 FIELD QUALITY CONTROL:

- A. Testing: Upon completion of installation of the IP Video/Camera Surveillance system and after electrical circuitry has been energized, test compatibility and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace them with new units, and proceed with retesting.
- 3.3 SYSTEM CONFIGURATION, PROGRAMMING, & COMMISSIONING SERVICES:
 - A. Configure the system for full operation. Include owner in the process as much as feasible to understand their intended operation and insure full transfer of operations to them.
 - B. Provide a fully commissioned system to ensure the entire system is operating as intended and in accordance with Owner requirements policy.
 - C. Contractor is to program the system and train the authorized personnel how to perform all necessary functions of the video surveillance system. Refer to Division 28 0501 Common Work Results for Electronic Safety & Security Part 5.2.

END OF SECTION 28 2300
DIVISION 31 – EARTHWORK

- 31 1000 SITE CLEARING
- 31 2000 EARTH MOVING

SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Removing existing vegetation as indicated on demolition plan.
 - 2. Clearing and grubbing.
 - 3. Stripping and stockpiling topsoil.
 - 4. Removing above and below-grade site improvements.
 - 5. Disconnecting, capping or sealing, abandoning site utilities in place, and removing site utilities.
 - 6. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security, protection facilities, and temporary erosion and sedimentation control procedures.
 - 2. Division 02 Section "Selective Demolition" for demolition of buildings, structures, and site improvements.
 - 3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site. Stripped topsoil shall only be removed from the property upon approval from the Owner.

1.5 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control Drawings, a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.
- E. Removal of underground utilities is included in Division 21, Division 22, Division 26, Division 27, and Division 28 Sections covering site utilities.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions such as shrubs, grass, and other vegetation to permit installation of new construction.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove top 1-2" of soil including all weeds, grass, brush and other vegetation and haul this material off-site before stripping topsoil. Actual depth of soil removal from site may vary depending on the amount of roots and plant material in the top 1-6" of soil. The base bid shall be

to strip up to 3" of soil, etc. from the site and dispose of it off-site. If additional material is deemed necessary for removal from the site, a change order will be issued. Consult with Landscape Architect on-site prior to stripping soil so that a visual inspection can be done. Contractor shall review the topsoil report already completed with the Landscape Architect at this meeting. See appendix 'A' for topsoil report.

- B. Strip only from 3" depth to 12" depth (the first 1-3" being disposed off of-site) of topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials. This depth of topsoil stripping may need to be modified based on the results of the topsoil test noted above and also based on observations at the meeting to be held on-site as discussed above. The contractor shall calculate how much soil is needed for the lawn areas and planter areas and then only needs to strip that much soil (less the amendments).
 - 1. Remove subsoil and non-soil materials from topsoil by screening all topsoil from trash, debris, weeds, roots, and other waste materials greater than ½ inch in any dimension.
 - 2. Amount of topsoil that needs to be stockpiled shall be determined by the following:
 - a. Strip all soils under buildings, structures, hardscaped/paved areas per civil, architectural, mechanical and structural drawings.
 - b. Strip enough topsoil based on quantity needed to install 4" depth of amended soil in lawn areas and 12" depth of amended soil in planter areas.
 - c. Topsoil depths in lawn and planter areas may be deeper than noted if at no additional cost to the Owner.
- C. Stockpile stripped topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 6 feet.
 - 2. Do not stockpile topsoil within tree protection zones.
 - 3. Minimize overworking of topsoil so that physical properties of topsoil are retained. Topsoil should be stripped and piled in a location that will not interfere with construction. Topsoil shall not be moved from location to location. Topsoil shall not be driven over with any equipment. Overworking of topsoil may invalidate the reuse of it for landscaping purposes. If topsoil is unusable due to overworking it, moving it, driving over it unnecessarily, etc, contractor shall at his own expense import topsoil to replace damaged topsoil as required. Contractor shall also bear the expense of disposal of any unusable stripped topsoil. Landscape contractor shall provide a second soils test for stockpiled topsoil prior to reuse in landscaped areas. Adjustments may need to be made to amendments depending on results of topsoil test.
 - 4. Dispose of excess topsoil as specified for waste material disposal as directed by the Owner. Owner retains all rights to stripped topsoil. Owner shall approve any removal of stripped topsoil from site however the contractor shall bear the cost to remove such soil as approved by the Owner.
 - 5. Stockpile surplus topsoil to allow for landscaping per plans. Depths of topsoil in lawn areas can be deeper than what is specified if excess soils are available for the extra depths, however, the Civil engineer must approve this and determine that all grading and drainage requirements can still be met by having deeper topsoil depths in lawn areas. Consult with Owner and Civil Engineer on-site prior to site work to discuss this and determine appropriate course of action to be taken.

3.6 SITE IMPROVEMENTS

- A. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction. Refer to project plans for improvements to be abandoned in place.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
 - 1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 31 1000

SECTION 31 2000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses and exterior plants.
 - 2. Subbase course for concrete walks and pavements.
 - 3. Subbase and base course for asphalt paving.
 - 4. Subsurface drainage backfill for walls and trenches.
 - 5. Excavation and backfilling for buildings and structures.
 - 6. Excavation and backfilling for utility trenches.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
 - 2. Division 2 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of aboveand below-grade improvements and utilities.
 - 3. Division 2 Section "Dewatering" for lowering and disposing of ground water during construction.
 - 4. Division 2 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
 - 5. Division 2 Section "Exterior Plants" for planting bed establishment and tree and shrub pit excavation and planting.
 - 6. Division 3 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.

1.2 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation

and replacement material will be paid for according to Contract provisions for changes in the Work.

- 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
- 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by an independent geotechnical testing agency, according to ASTM D 1586.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- 1.3 SUBMITTALS
 - A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.
 - C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.4 QUALITY ASSURANCE

A. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Use imported structural fill for structurally loaded areas and pavements. All earthwork shall be in accordance with the project geotechnical study.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 6 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Min 70% passing the ³/₄" sieve and max 50% passing No. 200 Sieve with a max Plasticity Index is set at 15 max.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Imported Structural Fill and Backfill: Naturally occurring or artificially graded mixture of sands and gravels (non-expansive granular soil), free of organics, vegetation, sod, trash, frozen materials, clay clods or other deleterious materials such as trash, frozen clods, clay clods, etc., with 100% passing the 4" sieve, a min of 70% passing the ³/₄" sieve, and 20% max passing the No. 200 Sieve. Liquid Limit is set at 30 max and Plasticity Index is set at 10 max. Structural Fill should be well-graded with a maximum particle size of 4 inches.
- E. Base Course at all Site Concrete Work: Sound, crushed, or uncrushed rock or gravel and sand, well graded as follows: (refer to APWA specs for base course.)

Sieve	% by Weight Passing Sieve
1 1/2"	100
1"	90 -100
3/"	70 – 85
1/2"	60 - 80
3/8"	55 – 75
#4	40-65

#16 25 -	- 40
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#200 7 – 11 (non-plastic)

Provide a 4 inch minimum of base course material beneath all site concrete work.

- F. Bedding Course: Type A-1-a or A-1-b (AASHTO Classifications soils per City Requirements.)
- G. Drainage Course: Narrowly graded mixture of sand, crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 200 sieve. Provide a minimum of 4 inch depth under all concrete building slab areas or as shown on plans.
- H. Cobble Material: Naturally or artificially graded mixture of angular rock. 4" to 12" in diameter.
- I. Drain Rock: For Fill in submerged area 3" Minus washed rock and pea gravel material with 0-25 passing the No 10, 0-15 Passing the No 40 and 0-5 Passing the No 200 Non Plastic should be used. If free draining fill is adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free drain fill. This would include the use of filter fabric between the two soil types. Fabric to be approved by geotechnical engineer.

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Pump ground water out of excavations and dispose of ground water in accordance with City requirements.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: The use of explosives is NOT allowed, unless specifically permitted by City Officials.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections. <u>Refer to geotechnical report for any over excavation requirements and depth of required structural fill for footing</u>. All undocumented fill found on site and indicated in the geotechnical report must be removed beneath footings and foundations.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work. Bottom of excavation to be compacted with a minimum of 4 passes of a approved non vibratory roller prior to erection of forms or placement of structural fill. If soft spots are encountered over excavate and stabilize as recommended in the geotechnical report.
 - 2. Excavations below or near ground water elevations (within 12" of ground water) shall extend below the footing, foundation or structure a minimum of 24" or as indicated in the plans and backfilled with cobble and drainage rock to stabilize the foundation support. End dump cobble and spread to a maximum of 15" loose lifts and compact cobbles by dropping a backhoe bucket uniformly over the surface at least 3 times. The first layer of structural backfill shall be "worked into" the underlying open graded fill to reduce long term settlement of the fill material. Provide drainage fabric separation when shown on plans.

- 3. Excavation for Underground Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- 4. Excavate 12" deeper than the required elevation required in rock areas or unyielding bearing material and backfill with imported engineered fill.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades. Subgrade to be prepared by proof-rolling to a firm non yielding surface to identify soft spots. If soft spots are encountered over excavate and stabilize as recommended in the geotechnical report (2' deep replacement min.)

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 - 1. Excavate trenches 12 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
 - 2. Excavate 16 inches minimum deeper than the elevation required for utilities that are to be placed at or near ground water (within 12 inches of ground water) and backfill with 12" min of drainage rock for pipe stabilization. Place drainage fabric over drainage rock prior to placement of pipe bedding material. Wrap the pipe zone material in drainage fabric if the pipe is below ground water level. Coordinate with City inspector if additional measures are required for utility support.

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. DO not route construction traffic over subgrade.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.

- 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with 2' of imported structural granular fill to stabilize soft areas or as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work. Soft spots caused by routing construction equipment over subgrade will be repaired without additional compensation.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
- 3.11 BACKFILL
 - A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
 - B. Place backfill on subgrades free of mud, frost, snow, or ice.
- 3.12 UTILITY TRENCH BACKFILL
 - A. Place backfill on subgrades free of mud, frost, snow, or ice.
 - B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
 - C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with bedding course material; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete Miscellaneous Cast-in-Place Concrete."

- D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- 3.13 SOIL FILL
 - A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
 - B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, native soils may be used as longs as they meet compaction requirements outlined in section 3.15 (top 6" topsoil).
 - 2. Under walks and pavements and artificial turf areas, use satisfactory soil material (fill as defined in the geotechnical report).
 - 3. Under steps and ramps, use structural fill.
 - 4. Under building slabs, use structural fill.
 - 5. Under footings and foundations, use structural fill.
 - 6. Under utility lines and utility structures, use bedding course material
 - 7. Pipe zone (bottom of pipe to 1 foot over the top of pipe), use bedding course material
 - C. Place soil fill on subgrades free of mud, frost, snow, or ice.
- 3.14 SOIL MOISTURE CONTROL
 - A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

- 1. Under structures, building slabs, steps, and pavements, compact each layer of backfill or fill soil material at 96 percent.
- 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
- 3. Under unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
- 4. For utility trenches, refer to city standards for utility trenching (96 percent min.). All fill and compaction in utility trenches both onsite and offsite must meet these requirements.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1/2 inch (not to exceed ADA max guidelines in ADA route).
 - 3. Pavements: Plus or minus 1/2 inch (not to exceed ADA max guidelines in ADA parking).
 - 4. Artificial Turf: Plus or minus 1/2 inch
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- 3.17 SUBBASE AND BASE COURSES
 - A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
 - B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
 - 1. Place base course material over subbase course under hot-mix asphalt pavement.
 - 2. Shape subbase and base course to required crown elevations and cross-slope grades.
 - 3. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 4. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 DRAINAGE COURSE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabson-grade as follows:
 - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick. Compact over drainage piping with 4 passes of smooth drum roller as required by pipe manufacture.

2. Compact drainage course material using 4 passes of a smooth drum 5 ton vibratory roller or equivalent each layer to required thickness.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test at each spot footing and for each 50 feet or less of wall length, but no fewer than 2 tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
- F. Contractor to provide the owner and engineer with a post construction topographic survey of the entire site within the project limit line indicating that the construction complies with the grades shown on sheet grading plans. The elevations shown on the grading plan are at finish surface (final elevation.) The elevations will be surveyed at the top of subgrade layer placed in the field (allowing for the thickness of the artificial turf and crusher course). Refer to the architectural plans for turf thickness requirements. Refer to earthwork specifications for grading tolerances allowed for the final surfaces. This survey is to be provided to the owner/architect for use by the engineer of record to prior of the final grading of the artificial turf. Contractor to regrade areas that do not meet the design grade elevations and slopes shown on the plans.
- G. The contractor to schedule the engineer of record in writing 3 days minimum before placement of concrete curbing, flatwork, or asphalt paving. All areas must be formed and have compacted base course in place for the engineer to complete a random spot grade check before asphalt and concrete construction. The random grade checks are for general conformance to slopes and grading shown on plans using a smart level. Random checks do not alleviate the contractor's responsibility to ensure grading is in conformance with plans and specifications and satisfy performance of his work. Within 2 days of the random spot check, results of the spot checks and areas of non compliance will be provided to the contractor and architect.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 2000

DIVISION 32 – EXTERIOR IMPROVEMENTS

- 32 1216 HOT-MIX ASPHALT PAVING
- 32 1313 SITE CONCRETE
- 32 1373 CONCRETE PAVING JOINT SEALANTS
- 32 3113 CHAIN-LINK FENCES & GATES

SECTION 32 1216 - HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Asphalt paving.
 - 2. Pavement marking.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.2 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. DOT: Department of Transportation.
- 1.3 SYSTEM DESCRIPTION
 - A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
 - 1. Standard Specification: Comply with APWA specifications, Latest edition, and with local governing regulations of more stringent than herein specified.
 - 2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For manufacturer.
- D. Material Test Reports: For each paving material.
- E. Material Certificates: For each paving material, signed by manufacturers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state of Utah.

- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.
- C. The OWNER will engage materials testing service for quality control during base and asphalt placement operations.
- D. Contractor Responsibility for Testing: Advise testing agency sufficiently in advance of operations to allow for completion of quality tests, and for assignment of personnel.

Deliver samplers of proposed base materials to testing agency for analysis and approval.

Assist testing agency representative to safely have access to the site during placement operations

E. Frequency of Tests: Owner's testing agency will be instructed to conduct field density tests of materials as follows:

Aggregate Base Course: Conduct one test for each 1000 square feet of each lift of material completed to 95% minimum of maximum dry density determined b ASTM D 1557-78.

Asphaltic Surface Course: Conduct one test for each 1000 square feet of material compacted to 96% minimum of design density as determined by ASTM D 1559-78 (Marshall Method).

- F. Grade Control: Establish and maintain required lines and elevations. Lay base course within plus or minus 1/4 inch in 10 feet of required elevations.
- G. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.

- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.
- 2.2 ASPHALT MATERIALS
 - A. Asphalt Cement: ASTM D 3381 for viscosity-graded material, use AC-10. ASTM D 6373 for penetration-graded material, use PG 58-22 or PG58-28 per current APWA Specifications.
 - B. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
 - C. Water: Potable.
 - D. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time less than 3 minutes.
 - 1. Color: White, Yellow, Red, and Blue (Coordinate with Owner)
 - 2. White for parking stripes (Coordinate with Owner)
 - 3. Yellow for safety markings. (Coordinate with Owner)
 - 4. Reflective white for crosswalks. White and blue for international accessibility symbols.
 - 5. Red for curb marking, where indicated by Fire Marshall.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Provide mixes to comply with the APWA Stds.
 - 2. 1/2 inch aggregate for parking areas, playgrounds and access roadways.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide formulated by manufacturer for that purpose.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at minimum temperature of 250 deg F.
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 - 4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hotmix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

3.7 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

- 1. Base Course: Plus or minus 1/2 inch.
- 2. Surface Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION 32 1216

SECTION 32 1313 - SITE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Driveways and concrete pads
 - 2. Curbs and gutters
 - 3. Walkways

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete pavement mixture.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94 requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type II, gray.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
- C. Water: ASTM C 94.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: ASTM C 494, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.2 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application

to fresh concrete.

2.3 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.4 STEEL REINFORCEMENT

- A. Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, ASTM A 775, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- B. Bar Supports: bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars or dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice".

2.5 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 6-1/2 percent plus or minus 1.5 percent.
 - 5. Cement: 6-1/2 bag mix.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to require lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement embedded in concrete flatwork.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edging true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed pavement surfaces with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with powerdriven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- A. Comply with ACI 306.1 for cold-weather protection.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. Ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screening, and bull floating or darbying concrete, but before float finishing.

- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these methods.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

Elevation: 1/4 inch. Thickness: Plus 3/8-inch, minus 1/4 inch. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch. Joint Spacing: 3 inches. Contraction Joint Depth: Plus 1/4 inch, no minus. Joint Width: Plus 1/8 inch, no minus.

- 3.9 REPAIRS AND PROTECTION
 - A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
 - B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.
 - C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313

SECTION 32 1373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Hot-applied joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, eight, Samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Pavement-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- D. Product certificates.
- E. Product test reports.
- F. Preconstruction compatibility and adhesion test reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021.
- B. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
 - B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Crafco Inc., an ERGON company; RoadSaver Silicone.
 - b. Dow Corning Corporation; 888.
 - c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Crafco Inc., an ERGON company; RoadSaver Silicone SL.
 - b. Dow Corning Corporation; 890-SL.
 - c. Pecora Corporation; 300 SL.
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; Urexpan NR-200.
 - 2.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Crafco Inc., an ERGON company; Superseal 444/777.
- B. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.
 - Products: Subject to compliance with requirements, provide one of the following:
 - a. Meadows, W. R., Inc.; Sealtight Hi-Spec or Sealtight 3405.
 - b. Right Pointe; D-3405 Hot Applied Sealant.
 - 2.

1.

- 2.4 JOINT-SEALANT BACKER MATERIALS
 - A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
 - B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
 - C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Cleaning of Joints: Clean out joints immediately before installing joint sealants.
- C. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- D. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place joint sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 - 1. Remove excess joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- G. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.
- H. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 32 1373

SECTION 32 3113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Chain-Link Fences: Industrial.
 - 2. Gates: Horizontal slide and swing.
- B. Related Sections include the following:
 - 1. Section 31 2000 "Earth Moving" for site excavation, fill, and backfill where chain-link fence and gates are located.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
 - 4. Accessories: Privacy slats, if used.
- B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.
- B. Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 INDUSTRIAL FENCE

- A. Selvage: Knuckled at one selvage and twisted at the other for 2-inch and 2-1/8-inch mesh sizes and heights above 60 inches.
- B. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:
 - 1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter (9 gage).
 - 2. Coating: ASTM A 817, Type 2, Class 1, zinc-coated (galvanized) applied after weaving.

2.2 FRAMING

A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. The following indicates these equivalents all measured in inches:

Actual	NPS	Trade
OD	Size	Size
1.660	1-1/4	1-5/8
1.900	1-1/2	2
2.375	2	2-1/2
2.875	2-1/2	3
3.500	3	3-1/2
4.000	3-1/2	4

B. Type I Round Posts: Standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, according to heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per sq. ft. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90, and weights per foot as follows:

Actual OD	Weight (lb/ft)	NPS Size
1.660	2.27	1-1/4
1.900	2.72	1-1/2
3.500	7.58	3
4.000	9.11	3-1/2

C. Roll-Formed Steel: Rolled form steel shapes produced from structural-quality steel conforming to ASTM A 570, grade 45, or ASTM A 446, grade D, galvanized, conforming to heavy industrial requirements of ASTM F 669, Group II, with a minimum yield strength of 45,000 psi. Protective coating system according to ASTM F 1234, Type A, hot-dip galvanized with a minimum of 2.0 oz. of zinc per sq. ft. according to ASTM A 123, 4.0 oz. of zinc per sq. ft. according to ASTM A 525.

- D. Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull, and end post.
 - 1. Round Steel: 1.660-inch OD Type I or II steel pipe.
- E. Steel posts for fabric heights 6 feet and higher:
 - 1. Round Line or Intermediate Posts: 2.375-inch OD Type I or II steel pipe.
 - 2. Round End, Corner, and Pull Posts: 2.875-inch OD Type I or II steel pipe.
- F. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.
- G. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive or top rail.
- H. Post Brace Assembly: Manufacturer's standard adjustable brace. Use material specified below for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, for each end.
 - 1. Round Steel: 1.660-inch OD Type I or II steel pipe.
- I. Tension Wire: 0.177-inch-diameter metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric. (If shown on plans.)
 - 1. Coating Type II zinc in the following class as determined by ASTM A 90.
 - a. Class 2, with a minimum coating weight of 1.20 oz. per sq. ft. of uncoated wire surface.
- J. Tie Wires: 0.106-inch-diameter (12-gage) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating according to ASTM A 641, or equal, to match fabric wire.
- 2.3 INDUSTRIAL SWING GATES
 - A. General: Comply with ASTM F 900 for single or double swing gate types.
 - 1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.
 - B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:
 - 1. Gate Fabric Height: 2 inches (50 mm) less than adjacent fence height.
 - 2. Leaf Width: As indicated.
 - 3. Frame Members:
 - a. Tubular Steel 1.90 inches (48 mm) round.
 - C. Frame Corner Construction:
 - 1. Welded 3/8-inch diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.

- D. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and keepers for each gate leaf more than 5 feet (1.52 m) wide.
 - 1. Single: Fork Latch.
 - 2. Double: Plunger type drop rod.
- 2.4 INDUSTRIAL HORIZONTAL-SLIDE GATES
 - A. General: Comply with ASTM F 1184 for single slide gate types.
 - 1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.
 - 2. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1184 for materials and protective coatings.
 - B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 1184 and the following:
 - 1. Gate Fabric Height: As indicated on drawings.
 - 2. Gate Opening Width: As indicated on drawings.
 - 3. Frame Members:
 - a. Tubular Steel: 2.375 inches (60.32 mm) round.
 - 4. Bracing Members:
 - a. Tubular Steel: 1.90 inches (48 mm) round.
 - C. Frame Corner Construction:
 - 1. Welded frame.
 - D. Roller Guards: As required per ASTM F 1184 for Type II, Class 1 gates.
 - E. Hardware: Latches permitting operation from both sides of gate, roll gate latch.

2.5 CONCRETE

- A. Concrete: Provide concrete consisting of portland cement per ASTM C 150, aggregates per ASTM C 33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi. Use at least four sacks of cement per cu. yd., 1-inch maximum size aggregate, 3-inch maximum slump.
- B. Packaged Concrete Mix: Mix dry-packaged normal-weight concrete conforming to ASTM C 387 with clean water to obtain a 2- to 3-inch slump.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

- 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
- 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

3.3 CHAIN LINK FENCE INSTALLATION

- A. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
- B. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.
 - 1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - a. Unless otherwise indicated, extend concrete footings 2 inches above grade and trowel to a crown to shed water.
- C. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
- D. Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension. (If shown on plans.)
- E. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.
- F. Fabric: Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.
- G. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.
 - 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.
- H. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.
- I. Privacy Slats: Install slats in direction indicated, securely locked in place. (If shown on plans.)
 - 1. Vertically.

3.4 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 32 3113

DIVISION 33 – UTILITIES

33 4100 STORM DRAINAGE SYSTEM

SECTION 33 4100 - STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. The extent of work is indicated on the Drawings and includes the following:
 - 1. New Boxes and inlets and Piping.
- B. The work includes but is not limited to:

Perform trenching and backfilling required for work of this Section.

1.2 RELATED SECTIONS

- A. Procedures and quality of excavating, backfilling, and compacting are specified in Division 31 Section "Earthwork".
- B. Concrete requirements related to this work are specified in Division 32 Section "Site Concrete."

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firms regularly engaged in manufacturing of products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. Products are limited to those of domestic manufacturers.
- B. Installer Qualifications: Firm with at least 3 years of successful installation experience on projects of similar scope.
- C. Codes and Standards: Comply with all applicable codes and requirements, including amendments and modifications by local jurisdictions, related to the performance of this work including, but not necessarily limited to the following: International Building Code, International Plumbing Code, International Mechanical Code, American National Standards Institute (ANSI), American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), Welding: Qualify Welding procedures, welders, and operators in accordance with ASME b31.1, or ASME B31.9 or ANSI and ASTM as applicable, for shp and project site welding of piping work. Utah Safety Standards (OSHA), Utah State Industrial Council

1.4 SUBMITTALS

- A. Product Data: Submit manufacturers' technical data and installation instructions for each type of material precast items and product furnished.
- B. Record Drawings: At project closeout, submit Record Drawings of installed utility service lines in accordance with Division 1 Requirements.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner and Architect no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE SYSTEM COMPONENTS

- A. For pipe 12" diameter or larger RCP. Per City Specifications.
- B. For pipe 6" diameter or smaller, PVC Pipe: ASTM D 3035 SDR 35, with bell and spigot type joints and elastomeric seals.

2.2 CATCH BASIN/CLEANOUT BOXES

- 1. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
 - A. Designated Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM c 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
 - 1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
 - 2. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 - 3. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
 - B. Frames and Grates: as specified on plans.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Excavate and backfill as specified in Section 312000.
- B. Locate lines as close as possible to those shown on Drawings.
- C. For sloped lines, grade to obtain fall required.
- D. Remove debris from trench prior to laying of pipe.
- E. Do not cut trenches near footings without consulting Architect.
- F. Backfill only after pipe lines have been inspected and approved by Architect.
- G. Failure to install joints properly shall be cause for rejection and replacement of piping system.

3.2 INSTALLATION OF STORM DRAINAGE SYSTEM

- A. General: Backfill only after pipe lines have been inspected and approved by Architect.
- B. Install cleanout boxes to grade as indicated on plans. Provide concrete collar around new and existing boxes. Use 4,000 psi concrete collars around inlets and cleanout boxes to grade.
- C. Install materials in accordance with Manufacturer's instructions.
- D. Grout smooth with non-shrink grout all inlet box joints, piping connections or ledges.

3.3 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

- 1. Submit separate reports for each system inspection.
- 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
- 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
- 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
 - 4. Submit separate report for each test.
- C. Leaks and loss in test pressure constitute defects that must be repaired.

E. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.4 CLEANING

A. Clean interior of piping and storm drain boxes of dirt and superfluous materials.

END OF SECTION 33 4100