

SPOKANE TRANSIT AUTHORITY
FUELING FACILITY
INVITATION FOR BID #2021-10628



**PROJECT SPECIFICATIONS AND
SPECIAL PROVISIONS**

December 19, 2021



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SECTION 001100 – ADVERTISEMENT FOR BIDS

ADVERTISEMENT FOR BIDS

Sealed bids will be accepted for the following project:

Project No.: 2021-10628
Project Title: Fueling Facility
Agency: Spokane Transit Authority (STA)
1230 W Boone Ave.
Spokane, WA 99201
Project Manager: Jessica Charlton
Capital Projects Manager
jcharlton@spokanetransit.com
509-325-6049
Public Bid Opening: 3:00 PM, Thursday February 10, 2022
Spokane Transit Authority
1230 W. Boone Avenue, Spokane, WA 99201
Pre-Bid Walk-through: 10:00 AM, Wednesday January 12, 2022
Spokane Transit Authority
1230 W. Boone Avenue, Spokane, WA 99201
Project Summary: This locally funded public works project consists of constructing below grade concrete vaults, installing three 20,000 gal. above ground tanks along with new equipment and piping. The project also includes a variety of civil, structural, mechanical, electrical, fire protection, controls, landscaping improvements as well as the decommissioning of six existing 20,000gal. underground storage tanks.

Please direct all questions regarding this project to the Project Manager stated above.

Bidders may obtain electronic copies of plans and specifications from the Project Manager. Plans and specifications may be viewed on STA's web site as well as several local and regional plan centers.

State of Washington prevailing wage rates are applicable for this public works project located in Spokane County. Bidders are responsible to verify and use the most recent prevailing wage rates. The "Effective Date" for this project is the Bid Form due date above.

No Bidder may withdraw their bid after the bid due date and time unless contract award is delayed for a period exceeding ninety (90) days.

The Agency reserves the right to accept or reject any or all bids and to waive informalities in the solicitation process.

Use of Minority and Women's Business Enterprise (MWBE) contractors and suppliers is encouraged, but not mandatory. Bidders may contact the Office of Minority and Women's Business Enterprise at <http://OMWBE.wa.gov/> to obtain information on certified firms. Bidders may also utilize Veteran-owned Businesses.

Spokane Transit Authority is an Equal Employment Opportunity (EEO) organization which does not discriminate on the basis of race, color, creed, national origin, sex, sexual orientation, gender identity, or

presence of any sensory, mental or physical disability in the consideration of contract award. The successful Bidder will be required to comply with all federal, state and local EEO laws and regulations.

Spokane Transit Authority assures nondiscrimination in accordance with Title VI of the Civil Rights Act of 1964. For more information, visit www.spokanetransit.com.

Upon request, alternative formats of this information will be produced for individuals with disabilities. The public bid opening facility is accessible for individuals using wheelchairs. For other accommodations, please call (509) 325-6094 (TTY WA Relay 711) at least forty-eight (48) hours in advance.

Issue Date: December 19, 2021

END OF SECTION 001100

SECTION 002100 – INSTRUCTIONS TO BIDDERS

DEFINITIONS

- A. **Addenda** are written or graphic instruments, approved and issued by the Owner prior to the time designated for opening of bids, which amend, modify or interpret the solicitation documents by identifying additions, deletions, clarifications or corrections.
- B. **Alternate** or **Alternate Bid** is the amount stated in the Bid to be added or deducted from the amount of the Base Bid if the corresponding change in project scope or materials or methods of construction described in the solicitation documents is accepted.
- C. **Architect, Engineer** or **A/E** means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.
- D. **Base Bid** is the sum stated in the Bid for which the Bidder offers to perform the work described as the Base, to which work may be added or deducted from sums stated in Alternate Bids (if any).
- E. **Bid** is the submission of a complete and properly signed Bid Proposal Form together with a bid guarantee, when applicable, and the certifications and representations required to comply with this solicitation.
- F. **Bidder** is one who submits a Bid for a Contract with the Owner for the Work described in the construction documents.
- G. **Bid Proposal Form** is the form provided in Section 004213 of this solicitation.
- H. **Contract** is the formal written executed agreement between Owner and Contractor authorizing Contractor to perform the Work in accordance with the Contract Documents.
- I. **Contractor** is the Bidder who has been awarded a Contract to perform the Work in accordance with the Contract Documents.
- J. **Contract Documents** means the Advertisement for Bids, Instructions to Bidders, executed Bid Proposal Form and Bidder certifications, Contract, General Conditions, Modifications to the General Conditions, Supplemental Conditions, Federal Terms & Conditions, Drawings, Specifications, any addenda and/or modifications thereof, any or all supporting documentation required by the above, special forms, or as requested by Owner.
- K. **Federal Assistance** means project funding provided, in whole or in part, by the US Department of Transportation, Federal Transit Administration (“FTA”).
- L. **Non-responsive Bid** means any Bid which fails to conform in all respects to the material requirements of this solicitation, imposes conditions which would modify requirements of this solicitation, or would limit a Bidder's liability to the Owner so as to give the Bidder an advantage over other Bidders as determined by the Owner.
- M. **Owner** means the Spokane Transit Authority, “STA” or its authorized representative with the authority to enter into, administer and/or terminate the Work in accordance with the Contract Documents, and make related determinations and findings.
- N. **Responsible Bidder** means a contractor who meets the criteria listed in RCW 39.04.350.
- O. **Unit Price** is an amount stated in the Bid as a price per unit of measurement or materials or services as described in the construction documents as defined in the General Conditions of the Contract.

PART 1 - GENERAL

1.1 INTRODUCTION

- A. Scope of Work. The general description and scope of work for the project can be found in Section 003100 of this solicitation.
- B. Schedule. Work may begin when the Contractor receives a formal “Notice to Proceed.” Contractor shall proceed with promptness and dispatch. The contractor must complete all exterior work no later than November 18, 2022. Some interior work may also be completed during this time however must not create a major disruption or relocation of operations. All work associated with fueling shut down, adding new dispensers, decommissioning the existing UST’s and repairing slabs must be delayed until the first sign of consistent dry weather Spring of 2023 and the entire project substantially complete no later than July 21, 2023

This schedule and pause in work are based on a 6-month minimum estimated lead time for the new tanks and is necessary for efficient STA’s operations and standard of service. Once there is consistent dry weather the bus washer system and on site fueling can be out of service however for a limited time due to the time and expense required to fuel at an alternative site. The desire to minimize these additional costs is what drives the July 21, 2023 substantial completion date.

- C. Public Records. Materials submitted in response to this competitive procurement shall become the property of Spokane Transit Authority. All received Bids shall be deemed public records as defined in Chapter 42.56 RCW *Public Records Act*. Any information in the Bid that the Bidder desires to claim as confidential and exempt from disclosure under the provisions of state law shall be clearly designated as “Confidential”. Each page claimed to be exempt from disclosure must be clearly identified by the word “Confidential” printed on it. Marking the entire Bid exempt from disclosure will not be honored. STA will consider a Bidder’s request for exemption from disclosure; however, STA will make a decision predicated upon state law and regulations. If any information is marked as Confidential in the Bid, it will not be made available until the affected Bidder has been given a reasonable opportunity to seek a court injunction against the requested disclosure. STA assumes no liability for disclosure of Confidential material submitted by Bidders. Bid submittals shall be considered public documents under applicable Washington state law and shall be available for inspection and copying by the public, except to the extent portions of the submittals are otherwise protected under applicable law. Each Bidder will be responsible for protecting any disclosure of its submittal under applicable law.
- D. Request for Information. Any prospective Bidder desiring an explanation or interpretation of this solicitation, drawings, specifications, etc., must submit a request in writing to the A/E seven (7) calendar days before the bid due date. Oral explanations or instructions given before the award of Contract will not be binding. Any information given a prospective Bidder concerning a solicitation will be furnished promptly to all other prospective Bidders by addendum to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective Bidders.
- E. Disadvantaged Business Enterprise. STA is committed to ensuring that all firms regardless of race, color, sex or national origin have equal opportunity to participate in STA contracts. Therefore, STA has established an annual agency goal for Disadvantaged Business Enterprise (DBE) participation in its contracting opportunities. In accordance with the legislative findings and policies set forth in Chapter 39.19 RCW, STA encourages participation in all of its contracts by Minority Business Enterprises (MBE), Women Owned Business Enterprise (WBE), and Minority Women Owned Business Enterprise (MWBE) firms certified by the Office of Minority and Women’s Business Enterprises (OMWBE). Participation may be either on a direct basis in response to this solicitation or as a subcontractor to a contractor submitting bids. However, unless

required by federal statutes, regulations, grants or contract terms referenced in the Contract Documents, no preference will be included in the evaluation of Bids, no minimum level of DBE/MBE/WBE/MWBE participation shall be required as a condition for receiving an award, and Bids will not be rejected or considered non-responsive on that basis. Any affirmative action requirements set forth in federal regulations or statutes included or referenced in the Contract Documents will apply.

1.2 PREPARATION OF BIDS – CONSTRUCTION

- A. Bids must be: (1) submitted on the Bid Proposal Form, or copies thereof, furnished by Owner or Owner's agent, and (2) signed in ink. The person signing a Bid must initial each change appearing on any Bid Proposal Form. If the Bid is made by a corporation, it shall be signed by the corporation's authorized designee. The address of the Bidder shall be typed or printed on the bid form in the space provided.
- B. The Bid Proposal Form may require Bidders to submit bid prices for one or more items on a varying basis, including: (1) lump sum base bid; (2) lump sum bid alternate prices; (3) unit prices; or (4) any combination of items 1 through 3 above.
- C. If the solicitation includes alternate bid items, failure to provide a price on any Alternates may disqualify the Bid. If bidding on all items is not required, Bidders should insert the words "No Bid" in the space provided for any item on which no price is submitted.
- D. Substitute bid proposals will not be considered unless this solicitation authorizes their submission.

1.3 BID PRICES

- A. The bid prices shown for each item on the Bid Proposal Form shall include all labor, material, equipment, overhead and compensation to complete all of the work for that item.
- B. The actual cost of building permit (only) and the public utility hookup fees will be a direct reimbursement to the Contractor or paid directly to the permitting agency by the Owner. Fees for these permits should not be included by the Bidder in the bid amount.
- C. The Bidder agrees to hold all Bid prices for ninety (90) days from date of bid opening.

1.4 ADDITIVE OR DEDUCTIVE BID ITEMS

- A. The low Bidder, for purposes of award, shall be the responsive Bidder offering the low aggregate amount for the Base Bid, plus Alternates selected by the Owner, and within funds available for the project.
- B. The Bidder agrees to hold all Alternate prices for ninety (90) days from date of bid opening.

1.5 TAXES

- A. 0.4 % of your bid price shall not include Washington State Sales Tax ("WSST"). However, all other taxes imposed by law shall be included. The Owner will include WSST in progress payments for this portion of the work. The Contractor shall remit applicable WSST to the Department of Revenue and shall furnish proof of remittance to the Owner if requested.
- B. 99.6% of this project qualifies as "public road construction" as described in WAC 458-20-171 ("Rule 171"). As such, your bid price shall include Washington State Sales Tax ("WSST"). **See section 007300 Supplemental Conditions for additional instruction.**

C. NOTE: Contractor must bond for total contract amount including WSST.

1.6 BID GUARANTEE

- A. When the sum of the Base Bid plus all Alternates is \$35,000.00 or less, a bid guarantee is not required. When the sum of the Base Bid plus all Alternates is greater than \$35,000.00, a bid guarantee in the amount of five percent (5%) of the Base Bid amount is required. Failure of the Bidder to provide a bid guarantee when required shall render the Bid non-responsive.
- B. Acceptable forms of bid guarantee are: A bid bond, U. S. postal money order, or certified check or cashier's check made payable to Spokane Transit Authority. The Owner will return bid guarantees (other than bid bond) to unsuccessful Bidders as soon as practicable, but not sooner than the execution of a contract with the successful Bidder. The bid guarantee of the successful Bidder will be returned to the successful Bidder with its official notice to proceed with the Work.
- C. The Bidder will allow ninety (90) days from the bid opening date for acceptance of its Bid by the Owner. The Bidder will return to Owner a signed Contract, insurance certificate and requisite bond(s) or bond waiver within fifteen (15) days after receipt of the Contract. If the apparent successful Bidder fails to sign all contract documents, provide the bond and insurance as required, or return the documents within fifteen (15) days after receipt of the Contract, the Owner may terminate the award of the Contract.
- D. In the event a Bidder discovers an error in its Bid following the bid opening, the Bidder may request to withdraw its Bid under the following conditions:
 - 1. Written notification is received by the Owner within twenty-four (24) hours following bid opening.
 - 2. The Bidder provides written documentation of the claimed error to the satisfaction of the Owner within seventy-two (72) hours following the bid opening.

The Owner will approve or disapprove the request for withdrawal of the Bid in writing. If the Bidder's request for withdrawal of its Bid is approved, the Bidder will be released from further obligation to the Owner without penalty. If it is disapproved, the Owner may retain the Bidder's bid guarantee.

1.7 ACKNOWLEDGEMENT OF ADDENDA

Bidders shall acknowledge receipt of all addenda to this solicitation by identifying the addenda numbers in the space provided for this purpose on the Bid Proposal Form. Failure to do so may result in the bid being declared non-responsive.

1.8 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK

- A. The Bidder acknowledges that it has taken steps necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling and storage of materials; (2) the availability of labor, water, electric power and road; (3) uncertainties of weather, river stages, tides or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during the work. The Bidder also acknowledges that it has satisfied itself as to character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including exploratory work done by the Owner, as well as from the drawings and specifications made a part of this solicitation. Any failure of the Bidder to take the actions described and acknowledged in this paragraph will not relieve the

Bidder from responsibility for estimating properly the difficulty and cost of successfully performing the work.

- B. If Bidder is unable to attend the scheduled pre-bid meeting, please contact STA to arrange a separate site visit. **Bids submitted by Bidders that have not either attended a pre-bid meeting or inspected the sites in the presence of STA staff will be considered non-responsive.**

1.9 PREVAILING WAGE

- A. The Work for this project constitutes a public work under RCW 39.04 *Public Works*. In accordance with RCW 39.12 *Prevailing Wages on Public Works*, the Contractor shall pay the highest prevailing wage rate by trade or occupation as specified by the State of Washington, Department of Labor and Industries.
- B. If this Project is subject to Federal Assistance, the Contractor shall pay the *greater* of prevailing wages paid in accordance with the Davis Bacon and Related Acts or RCW 39.12 *Prevailing Wages on Public Works*. See Section 007200.1 *Public Works General Conditions*.

1.10 SUBMISSION OF BIDS

- A. Bids must be submitted on or before the time specified in the Advertisement for Bids or as extended by written addenda to this solicitation.
- B. Bids shall be submitted in a sealed envelope addressed to the office specified in the Advertisement for Bids. Oral, telephonic, electronic or facsimile bids are invalid and will not receive consideration. The envelope shall have printed on the outside:
 - 1. The project number and description.
 - 2. The name and address of the Bidder.
 - 3. Identification as Bid Proposal.
- C. Prior to the bid opening, the Owner's representative will designate the official bid clock. Any part of the Bid or Bid modification not received prior to the times specified, per the designated bid clock, will not be considered and the Bid will be returned to the Bidder unopened.
- D. A Bid may be withdrawn in person by the authorized representative of the Bidder before bid opening. The representative of the Bidder will be required to show ID and sign the bid summary sheet before the Bid will be released to Bidder.
- E. Individuals with disabilities who wish to request special accommodation, (e.g., sign language interpreters, Braille, etc.) need to contact the Owner ten (10) working days prior to the scheduled bid opening.

1.11 CONSIDERATION OF BIDS

- A. Owner shall have the right to reject any or all Bids, to reject Bids considered non-responsive, including but not limited to, Bids not accompanied by any required bid guarantee, Bidder certifications or data required by the solicitation, or a Bid not signed by the Bidder's authorized representative.
- B. The Owner shall have the right to waive any informality or irregularity in any Bid received.
- C. In the event that a single Bid is received, Owner will conduct a cost/price analysis of the Bid. This analysis will compare the price and quality of the proposed equipment with that involved in recent similar purchases with similar specifications made by this or other governmental agencies in an attempt to determine the competitive integrity of the submitted Bid.

1.12 BID RESULTS

After the bid opening, Bidders may obtain bid results from the Owner.

1.13 RESPONSIBLE BIDDER

- A. To be considered a “Responsible Bidder”, at the time of Bid submittal, Bidders must meet all requirements specified in Section 004512 *Bidder Responsibility Criteria*.
- B. Supplemental Responsibility Criteria: In addition to the mandatory Bidder responsibility criteria, the Owner may adopt relevant supplemental criteria for determining Bidder responsibility applicable to a project which the Bidder must meet. Where applicable, such supplemental criteria shall be attached to this solicitation.
 - 1. At least seven (7) days prior to the bid submittal deadline, a potential Bidder may request the Owner modify the supplemental responsibility criteria. The Owner will evaluate the information submitted by the potential Bidder and respond before the Bid submittal deadline. If the evaluation results in a change of the supplemental responsibility criteria, the Owner will issue an addendum to this solicitation identifying the new and/or modified criteria.
 - 2. Upon Owner’s request, the apparent low Bidder must supply the requested responsibility information within two (2) business days of request by Owner. Withholding information or failure to submit all the information requested within the time provided may render the Bid non-responsive.
 - 3. Upon request of the Owner, a Bidder whose Bid is under consideration for award of Contract shall submit promptly satisfactory evidence of his/her financial resources, experience, organization, and equipment available for performance of the Contract on AIA Form A305 “Contractor’s Qualification Statement” or similar form approved by the Owner.
- C. Not-responsible Bidder Notification.
 - 1. If the Owner determines that the apparent low Bidder is not responsible, the Owner will notify the Bidder of its preliminary determination in writing.
 - 2. Within three (3) days after receipt of the preliminary determination, the Bidder may withdraw its Bid or request a hearing where the Bidder may appeal the preliminary determination and present additional information to the Owner.
 - 3. The Owner will schedule a hearing within three (3) working days of receipt of the Bidder’s request. The hearing members will include a STA Executive or their designee, and Project Manager.
 - 4. The Owner will issue a final determination after reviewing information presented at the hearing.
 - 5. If the Owner determines a Bidder to be not responsible, the Owner will provide, in writing, the reasons for the determination. If the final determination affirms that the Bidder is not responsible, the Owner will not execute a Contract with any other responsible Bidder until two (2) business days following submittal of the final determination to the not responsible Bidder.
 - 6. The Owner’s final determination is specific to this project and will have no effect on other or future projects.

1.14 CONTRACT AWARD

- A. The Owner will evaluate Bid responsiveness and responsibility.

1. A Bid will be considered responsive if it meets the following requirements:
 - a. It is received at the proper time and place.
 - b. It meets the stated requirements of this solicitation.
 - c. It is accompanied by a bid guarantee, when required.
2. A Bid will be considered responsible if it meets the following requirements:
 - a. It is submitted by a licensed/registered contractor within the state of Washington at the time of bid opening and is not banned from bidding on Public Works projects as determined by the Department of Labor and Industries; and
 - b. It meets the mandatory responsibility criteria established in RCW 39.04.350 for prime contractors and subcontractors and an overall accounting of the supplemental responsibility criteria established for the project.
- B. The Owner reserves the right to accept or reject any or all Bids and to waive informalities.
- C. The Owner may negotiate Bid price adjustments with the low responsive Bidder, including changes in the Contract Documents, to bring the Bid within the available funding per RCW 39.04.015.
- D. The apparent low Bidder, for purpose of award, shall be the responsive and responsible Bidder offering the low aggregate amount for the Base Bid plus selected Alternates and meeting all other bid submittal requirements.
- E. The Contract will only become effective when signed by the Owner. Prior to the Owner's signature, any and all costs incurred shall be the sole responsibility of the Bidder.
- F. The Contractor must purchase and maintain insurance coverages as stated in Section 007200.1 *General Conditions*.
- G. Note: AIA Payment Bond and Performance Bond forms (A312) are required. These forms will not be provided by the Owner.

1.15 CONTRACT DOCUMENTS

- A. The Contract Documents under which it is proposed to execute this work consists of all material bound herein, plus any addenda incorporated into the documents.
- B. The Contract Documents are intended to be mutually cooperative and to provide all details reasonably required for the execution of the Work. Any person contemplating the submission of a Bid shall have thoroughly examined all of the various parts of the Contract Documents, and should there be any doubt as to the meaning or intent of the Contract Documents, the Bidder should request in writing to the A/E at least seven (7) working days prior to bid opening, an interpretation thereof. Any interpretation or change in the Contract Documents will be made only in writing, in the form of an addendum to the Contract Documents and will be furnished to all prospective Bidders receiving a set of documents, who shall indicate receipt of same in the space provided on the Bid Proposal Form. The Owner will not be responsible for any other explanation or interpretation of said documents.

1.16 DISCREPANCIES & CONTRACT DOCUMENT REVIEW

- A. The intent of Spokane Transit Authority and Federal Funded Project Contract Documents is to describe a complete Project. These Contract Documents are complimentary. What is required by one part of the Contract Documents shall be binding as if required by all.

- B. In the event of a discrepancy between Spokane Transit Authority and Federal Funded Project Contract Documents, the Contractor will use the Contract Document that imparts the highest cost to their Bid and/or longest delay in their schedule. It is the responsibility of the Contractor to bring these discrepancies to the attention of the Architect as soon as they are discovered.

1.17 PROTEST PROCEDURES

STA maintains a set of protest procedures. If any Bidder desires this information, it may be obtained by calling Jessica Charlton, Capital Project Manager, at (509) 325-6049.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION 002100

SECTION 003100 – PROJECT DESCRIPTION AND SCOPE OF WORK

PROJECT DESCRIPTION

This locally funded public works project consists of constructing a new fuel facility for STA's Fixed Route Maintenance Garage by constructing below grade concrete vaults to house three new 20,000 gallon above ground storage tanks that will contain diesel. All piping and new equipment, including dispensers, are included in addition to construction of paved driveways and walks, a grass paver access road, stormwater swales and structures, as well as landscaping improvements at the new fuel facility and along the public right of way at the southern property line of STA's fixed route garage. The work includes, but may not be limited to trades in the following areas: earthwork (including mitigation of impacted soils), trucking, crane rigging and hoisting, shoring (drilling and steel), rebar, concrete, tank installers and decommissioners, diesel fuel dispensing, piping, controls/tank monitoring/leak detection installers and commissioning, landscaping, fencing, lighting, security cameras, secure access as well as decommissioning of existing underground storage tanks.

PROJECT LOCATION

Spokane Transit Authority's Fixed Route Garage at 1229 W. Boone Avenue, Spokane, WA.

PROJECT SCHEDULE

Work may begin when the Contractor receives a formal "Notice to Proceed." Contractor shall proceed with promptness and dispatch. The contractor must complete all exterior work no later than November 18, 2022. Some interior work may also be completed during this time however must not create a disruption or relocation of operations. All work associated with fueling shut down, adding new dispensers, decommissioning the existing UST's and repairing slabs must be delayed until the first sign of consistent dry weather Spring of 2023 and the entire project substantially complete no later than July 21, 2023.

This schedule and pause in work are based on a 6-month minimum estimated lead time for the new tanks and is necessary for efficient STA's operations and standard of service. Once there is consistent dry weather the bus washer system and on site fueling can be out of service however for a limited time due to the time and expense required to fuel at an alternative site. The desire to minimize these additional costs is what drives the July 21, 2023 substantial completion date.

PROJECT EXCLUSIONS

New or temporary fluids. STA will provide all necessary fluids for testing, commissioning, and operations.

PROJECT GENERAL SCOPE OF WORK

The project shall generally consist of but may not be limited to:

1. Obtaining and paying for trade specific permits and fees (to be included in your bid price).
2. Obtain and pay for all City of Spokane Building Department, City of Spokane Fire Department, and Washington State Ecology permit fees. These fees will be reimbursable paid to the contractor by STA with no markup.
3. Complete and supply to STA tank installation and decommissioning checklists, assist with new tank registration documentation (which could require but may not be limited to cut sheets, manufacturer name/model/serial numbers, tank dimensions, etc.) as well as tank closure documentation and notices.
4. All notifications and checklists required by the Washington State Department of Ecology (DOE) to be completed by Contractor.

5. Establish and maintain jobsite safety and security measures to include but may not be limited to traffic control when needed, Fencing to secure the work areas, safety and warning signage, candle sticks and caution/hazard tape, lighting if needed, etc.
6. Perform/coordinate thorough public and private utility locates
7. Selective demolition as per plan and specification
8. Mitigate impacted soils as per plan and specification
9. Excavations and installation of temporary shoring as per plan and specification
10. Construct below grade concrete vaults as per plan and specification
11. Install new AST's associated equipment and product lines as per plan and specification
12. Perform AST tightness testing on all new tanks and new product lines. Provide results to Owner
13. Grade and construct access (drives and pavers) as per plan and specification
14. Construct and install stormwater swales, catch basins, drywells, etc. as per plan and specification
15. Construct new driveways as per plan and specification
16. Replace concrete sidewalks and street trees as per plan and specification
17. Install fencing and gating as per plan and specification
18. Install security measures as per plan and specification
19. Replace fuel dispensers as per plan and specification
20. Abandon/clean/sample existing tanks as per plan and specification
21. Replace interior concrete slab and slab drains as per plan and specification
22. Assist Owner in closeout/updating procedures for tank ID tags and records
23. Record all "as-built" information for delivery to Owner as required for final closeout
24. All work to be completed as shown and specified in the associated plans and specifications

PROJECT-SPECIFIC NOTES

- The contractor/subcontractor performing the tank installations and decommissioning must be registered with and approved by the City of Spokane Fire Department prior to the bid due date. The link for that application is here: [Underground Storage Tank Servicer Registration Form \(spokanecity.org\)](https://spokanecity.org/underground-storage-tank-servicer-registration-form)
- Contractors and each of their subcontractors of any tier, shall comply with all current and future COVID-19 proclamations, regulations, requirements and/or related guidance issued by the Governor of Washington State as it may relate to STA construction projects. As such, a site-specific safety plan (SSSP) will be required for the project which must include COVID-19 measures. Face coverings must be worn at all times indoors at STA facilities and while working outdoors if a minimum of 6ft of separation is not feasible to perform the work.
- Taxes - The bid form is broken down into separate Bids to separate Rule 171 from Rule 170.
 - For the remainder of the project
 - 0.4% falls under Rule 170, contractors are to exclude sales tax from this bid item.
 - 99.6% falls under Rule 171, contractors are to include applicable sales tax in this bid item.
- Contractor shall protect building and shoring monitoring devices and allow monitoring activities by STA's contracted consulting firms, Coffman Engineers, Inc. and Budinger & Associates, Inc. throughout the project.

- The contractor shall allow access by representative of, and coordinate as needed with, STA's contracted Geotechnical, Environmental and Special inspections consultant, Budinger & Associates, Inc. throughout the project.
- All work shall meet or exceed all applicable codes, utility locating, rules and regulations, as set forth by the City of Spokane, Spokane County and the State of Washington.
- Contractor is responsible for the supply of all equipment, materials and labor, and otherwise do all things necessary for or incidental to completion of the Project.
- Contractor is responsible for making arrangements for staging of materials and equipment, if necessary.
- Contractor shall be responsible for the removal of all trash and waste materials from this project. All items that are disposed of shall be approved by the Project Manager and/or designee. Damages resulting from Contractor negligence shall be repaired immediately at no cost to STA. The Contractor shall take all precautions necessary to protect private property and the public during the construction period.
- All work will be subject to inspection and acceptance by STA's project manager or their designee prior to payment.
- STA reserves the right to increase or decrease the number of related services listed in the scope of work for a fairly negotiated price.

END OF SECTION 003100

SECTION 004200 – BID SUBMITTAL CHECKLIST

This checklist ***must be completed in its entirety, signed and included*** with submittal of your signed Bid Proposal Form. Failure by Bidder to properly complete, sign and include this checklist with its Bid Proposal Form shall render the Bid non-responsive and shall be grounds for rejection of the Bid.

CHECKLIST

- ☐ Section 004200 Bid Submittal Checklist
- ☐ Section 004213 Bid Proposal Form
- ☐ Section 004215 Bid Response Form
- ☐ Section 004512 Bidder Responsibility Criteria
- ☐ Section 004546.E Certificate of Wage Compliance
- ☐ Bid Guarantee See subsection 1.6 of Section 002100 Instructions to Bidders.
- ☐ Bid submitted in a sealed envelope identifying the following on the front of the envelope:
 - Project Name: Fueling Facility
 - Contract Number: 2021-10628
 - Bidder Name: XXX
 - Bidder Address: XXX

If Bid is submitted via mail, the sealed envelope required above shall be in addition to the envelope used for mailing.

STATEMENT OF COMPLIANCE

The undersigned has reviewed and fully understands the required Bid Documents and this Bid Submittal Checklist and certifies that all required documents, as marked herein and required by the specifications, are included in its Bid Proposal.

Authorized Signature: _____ Date: _____

Name: _____ Title: _____

Bidder Name: _____

END OF SECTION 004200

SECTION 004213 – BID PROPOSAL FORM

Bidder Name: _____

Each Bid item below shall constitute an offer to STA as outlined herein. By executing below and having submitted its Bid, Bidder acknowledges no Bidder may withdraw its Bid after the hour and date set for the bid opening except as permitted by Section 002100, Instructions to Bidders.

STA reserves the right to accept or reject any or all Bids within ninety (90) days of the Bid Due Date. Bidder understands and agrees any additional taxes, permits, bonds, business licenses, contractor registrations, prevailing wages, certifications and fees, and any other ancillary charges, as applicable, have been included in the respective Bid item.

Basis of Award. The “Lowest Bid” shall be lowest sum of the Base Bid and accepted Alternates, if any. Award of Contract, if any, shall be to the responsive and responsible Bidder submitting the Lowest Bid.

In compliance with the Contract Documents, the following Bid Proposal is submitted:

BID A – 0.4%, portion of project qualifying for standard tax requirements (Rule 170)	
	\$
(Please print dollar amount in space above)	DO NOT INCLUDE Washington State Sales Tax
SHORING & TRENCH EXCAVATION SAFETY PROVISIONS	\$
If the bid amount contains any work which requires trenching excavation exceeding a depth of four (4) feet, all costs for trench safety shall be included in the Base Bid for adequate trench safety systems in compliance with Chapters 39.04 RCW & 49.17 RCW and WAC 296-155-650.	amount included in Bid A amount above.
BID B – 99.6%, portion of project qualifying as Public Road Construction (Rule 171)	
	\$
(Please print dollar amount in space above)	INCLUDE Washington State Sales Tax
SHORING & TRENCH EXCAVATION SAFETY PROVISIONS	\$
If the bid amount contains any work which requires trenching excavation exceeding a depth of four (4) feet, all costs for trench safety shall be included in the Base Bid for adequate trench safety systems in compliance with Chapters 39.04 RCW & 49.17 RCW and WAC 296-155-650.	amount included in Bid B amount above.
TOTAL BID	
	\$
(Please print dollar amount in space above)	Sum of Bid A + Bid B

ALTERNATES	<i>Specify additive or deductive.</i>
{There are no bid alternates on this project}	<input type="checkbox"/> Add <input type="checkbox"/> Deduct
(Please print dollar amount in space above)	INCLUDE Washington State Sales Tax

UNIT PRICES	
Export of impacted soils to a local solid waste facility	\$ / TON
	DO NOT INCLUDE Washington State Sales Tax
Hard Rock Removal	\$ / CY
	DO NOT INCLUDE Washington State Sales Tax
Unit prices shall include full compensation for the cost of labor, materials, equipment, overhead, profit and any additional cost associated with the unit bid.	

The undersigned agrees to perform the Work in accordance with the Contract Documents as bid herein.

Signature: _____

Date: _____

Name: _____

END OF SECTION 004213

SECTION 004215 – BID RESPONSE FORM

Bidder Name: _____

The Bid shall constitute an offer to STA as outlined herein and in the Bid Proposal Form. No Bidder may withdraw its Bid following the Bid Due Date, except as allowed under Section 002100 – Instructions to Bidders.

1. EXAMINATION OF DOCUMENTS

A. Having carefully examined all Contract Documents, **as well as the site and local conditions affecting the Work**, the undersigned proposes to perform all Work in accordance with the Contract Documents for compensation to be computed from prices submitted on the Bid Proposal Form.

B. Receipt of the following Addenda is hereby acknowledged:

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

C. STA reserves the right to reject any or all Bids, portions or parts thereof, and to waive minor informalities in the Bid process.

2. TIME FOR COMPLETION

The Bidder agrees to coordinate the completion of all exterior work no later than November 18, 2022 and reach substantial completion for the project in its entirety no later than July 21, 2023. See also Section 002100 part 1.1.B and Section 003100 Project Schedule.

3. FREIGHT

Bid prices shall include all freight costs to each project site and shall be FOB Destination.

4. ANTI-KICKBACK

No officer or employee of STA, having the power or duty to perform an official act or action related to this Bid, shall have or acquire any interest in this submittal, or have solicited, accepted or granted a present or future gift, favor, service or other thing of value from or to any person involved in this Bid.

5. FEDERAL DEBARMENT

The undersigned represents that the Bidder and all offices with any controlling interest herein are not currently, and have not previously, been on any debarred bidders list maintained by the United States Government.

6. UBI CERTIFICATION

I CERTIFY that no final determination of violation of RCW 50.12.070(1)(b) or 82.32.070(1)(b) has been made by the Washington State Departments of Employment Security, Labor and Industries or Revenue respectively dated within two (2) years of the Bid Due Date. I understand further that no Bid may be submitted, considered or contract awarded for a public work to any person or entity that has a

determination of violation of the above reference statutes within two (2) years from the date that a violation is finally determined and the Bid Due Date.

7. AWARD OF CONTRACT

- A. If written notice of acceptance of all or part of this Bid is mailed, sent electronically or delivered to the undersigned within ninety (90) Days after the Bid Due Date, the undersigned will, within **fifteen (15) Days** after date of such notice, execute and deliver to Owner the Contract as specified and furnish all requisite documentation including, but not limited to, Certificates of Insurance (send to coi@spokanetransit.com) and Payment and Performance Bonds, as required. Payment & Performance Bonds must be submitted in their original form. Electronic copies will not be accepted.
- B. If the undersigned fails to complete the above requirements, the Bidder's Guarantee shall be forfeited to the Owner.

I CERTIFY, to the best of my knowledge, the information contained in this Bid is accurate and complete and that I have the legal authority to commit this firm to a contractual agreement. I realize the final funding for any service is based upon budget levels and the approval of the Spokane Transit Authority's Board of Directors.

Bidder Name: _____
(as registered with the State of Washington)

Authorized Signature: _____ Date: _____

Printed Name and Title: _____

1. BIDDER ADMINISTRATIVE INFORMATION

Company Name: _____
(as registered with the State of Washington)

Physical Address: _____

Mailing Address: _____

Telephone: _____ Fax: _____

Primary Contact: _____

Phone: _____ Email: _____

Washington Contractor License No.: _____

Washington UBI No.: _____

Washington Industrial Insurance Account No.: _____

Federal Tax Identification No.: _____

2. BIDDER INSURANCE COMPANY

Agency Name: _____

Mailing Address: _____

Telephone: _____ Fax: _____

Primary Contact: _____

Phone: _____ Email: _____

3. BIDDER SURETY

Surety Name: _____

Mailing Address: _____

Telephone: _____ Fax: _____

Primary Contact: _____

Phone: _____ Email: _____

I certify the information above is true and correct:

Authorized Signature: _____ Date: _____

Printed Name and Title: _____

BIDDER QUALIFICATION STATEMENT

The following statements of experience, personnel, equipment, and general qualifications of the Bidder are submitted with the assurance that the Owner can rely on its accuracy and truthfulness. If more space is required for your answers, please attach a continuation sheet(s) to the corresponding bid response page referencing the item number.

1. The Company has been in business continually since _____ (month & year).
2. The Company has experience equivalent to that required under this Invitation for Bid:
 - a. As a prime contractor for _____ years.
 - b. As a subcontractor for _____ years.
3. List below work previously completed that is equal to or greater than the scope and complexity of that required under this Invitation to for Bid.

Year	Project Name	Project Location	Contract \$	Project Owner & contact info

4. List supervisory personnel and/or project manager(s) currently employed by the Bidder that will be responsible for the Work on this project. Attach a brief (1 page maximum) resume for each individual listed.

Name	Title	Experience (years)

5. List all projects and/or contracts the Bidder has undertaken in the previous five (5) years which have resulted in:

a. Arbitration or litigation:

Year	Project Name	Project Location	Project Owner & contact info

b. Claims and/or violations filed by the Federal Government and/or the State of Washington Department of Labor & Industries, Department of Revenue or Employment Security Department:

Year	Project Name	Project Location	Project Owner & contact info

c. Liens filed by suppliers and/or subcontractors:

Year	Project Name	Project Location	Project Owner & contact info

I certify the information above is true and correct:

Authorized Signature: _____ Date: _____

Printed Name and Title: _____

SUBCONTRACTOR LIST

The Owner requests the Bidder list subcontractors and consultants, if applicable, of each work discipline applicable to the performance of Work. If no subcontractors and/or consultants are listed, it will be considered the Bidder's affirmation that it does not intend to use any subcontractors and/or consultants in its performance of the Work.

For projects that are estimated to exceed \$1 million dollars, in accordance with RCW 39.30.060, Bidders may submit (1) within one (1) hour after the Bid Due Date, the names of subcontractors with whom the Bidder, if awarded a Contract, will subcontract with for the performance of HVAC (heating, ventilation, and air conditioning), plumbing as described in RCW 18.106, and electrical as described in RCW 19.28, as well as the tank installer and decommissioner, or to name itself for the work; and (2) within forty-eight (48) hours after the Bid Due Date, the names of subcontractors with whom the Bidder, if awarded a Contract, will subcontract with for the performance of structural steel installation and rebar installation. At the time of bid or within forty-eight (48) hours STA also requests the name of the UST Servicer/Technician the Bidder will subcontract with.

For additional consultants and/or subcontractors, attach copies of the second page of this Subcontractor List.

Type of work: _____	
Company Name: _____ (as registered with the State of Washington)	
Physical Address: _____	
Mailing Address: _____	
Telephone: _____	Fax: _____
Primary Contact: _____	
Phone: _____	Email: _____
WA Contractor License No.: _____	WA UBI No.: _____
WA Industrial Insurance Account No.: _____	Federal Tax Id No.: _____

Type of work: _____	
Company Name: _____ (as registered with the State of Washington)	
Physical Address: _____	
Mailing Address: _____	
Telephone: _____	Fax: _____
Primary Contact: _____	
Phone: _____	Email: _____
WA Contractor License No.: _____	WA UBI No.: _____
WA Industrial Insurance Account No.: _____	Federal Tax Id No.: _____

Type of work: _____	
Company Name: _____ (as registered with the State of Washington)	
Physical Address: _____	
Mailing Address: _____	
Telephone: _____	Fax: _____
Primary Contact: _____	
Phone: _____	Email: _____
WA Contractor License No.: _____	WA UBI No.: _____
WA Industrial Insurance Account No.: _____	Federal Tax Id No.: _____

Type of work: _____	
Company Name: _____ (as registered with the State of Washington)	
Physical Address: _____	
Mailing Address: _____	
Telephone: _____	Fax: _____
Primary Contact: _____	
Phone: _____	Email: _____
WA Contractor License No.: _____	WA UBI No.: _____
WA Industrial Insurance Account No.: _____	Federal Tax Id No.: _____

Type of work: _____	
Company Name: _____ (as registered with the State of Washington)	
Physical Address: _____	
Mailing Address: _____	
Telephone: _____	Fax: _____
Primary Contact: _____	
Phone: _____	Email: _____
WA Contractor License No.: _____	WA UBI No.: _____
WA Industrial Insurance Account No.: _____	Federal Tax Id No.: _____

Authorized Signature: _____ Date: _____

Printed Name and Title: _____

Upon receipt of a Notice to Proceed for construction, Contractor shall:

[illegible]

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Printed Name and Title: _____

V. 072320

SECTION 004512 – BIDDER RESPONSIBILITY CRITERIA

In accordance with RCW 39.04.350, a Bidder must meet the following responsibility criteria to be considered a responsible bidder and qualified to be awarded a public works project. The Bidder must at the time of bid submittal:

1. Have a certificate of registration in compliance with chapter 18.27 RCW;
2. Have a current state unified business identifier (UBI) number;
3. If applicable, have industrial insurance coverage for the Bidder's employees working in Washington as required in Title 51 RCW; an employment security department number as required in Title 50 RCW; and a state excise tax registration number as required in Title 82 RCW;
4. Have received training on the requirements related to public works and prevailing wage under this chapter and chapter [39.12](#) RCW. The training must be provided by the Department of Labor and Industries or by a training provider whose curriculum is approved by the Department. Bidders that have completed three (3) or more public works projects, have had a valid business license in Washington for three (3) or more years, and are listed on the Department of Labor and Industries exemption list are exempt from this training requirement;
5. Within the three (3) year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries, or through a civil judgment entered by a court of limited or general jurisdiction, to have willfully violated, as defined in RCW [49.48.082](#), any provision of chapter [49.46](#), 49.48, or [49.52](#) RCW; and
6. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).

In accordance with RCW 39.06, a public works contractor must verify responsibility criteria for each first-tier subcontractor, and a subcontractor of any tier that hires other subcontractors must verify responsibility criteria for each of its subcontractors. Verification shall include that each subcontractor, at the time of subcontract execution, meets the responsibility criteria and possesses an electrical contractor license, if required by RCW 19.28, or an elevator contractor license, if required by RCW 70.87. This verification requirement, as well as the responsibility criteria, must be included in every public works contract and subcontract of every tier.

Providing the following information is **MANDATORY** in order to meet "Responsible Bidder" requirements. Failure to provide this information may disqualify your bid as being "**Non-Responsive**". *If your business is not required to have one of the following numbers, provide an explanation.*

1. State of Washington Contractor Registration No. _____
2. State of Washington Unified Business Identifier No. _____
3. Employment Security Department No. _____
4. State Excise Tax Registration No. _____
5. Is the payment of Worker's Comp (Industrial Insurance) Premiums current? If your business does not have a Worker's Comp account with the WA State Dept of L&I, please explain why.
☐ Yes
☐ No (If No, you are not eligible to bid on this project)
☐ No Account – Explain why: _____
6. Are you disqualified from bidding on public works projects in the State of Washington?
☐ Yes (If Yes, you are not eligible to bid on this project)
☐ No

END OF SECTION 004512

SECTION 004546.F – CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUES

The Bidder hereby certifies that within the three-year period immediately preceding the Bid Due Date, the Bidder is not a “willful” violator, as defined in RCW 49.48.082, of any provision of Chapters 49.46, 49.48 or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the State of Washington, Department of Labor and Industries or through a civil judgement entered by a court of limited or general jurisdiction.

I certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct:

Bidder Name: _____

Authorized Signature¹: _____ Date: _____

Printed Name and Title: _____

City & State: _____

Company Type: ☐ Sole Proprietor ☐ Partnership² ☐ Joint Venture ☐ Corporation

State of Incorporation or formation: _____

¹ If a Corporation, the Bid must be executed in the corporate name by the president, vice-president, or any other corporate officer accompanied by evidence of authority to execute. If a Partnership, the Bid must be executed by a Partner.

² If a Partnership, provide name of firm under which business is transacted: _____

END OF SECTION 04546.E

**SPOKANE TRANSIT AUTHORITY PUBLIC WORKS
CONSTRUCTION CONTRACT 20XX-10XXX**

This Contract is made by and between **XXX** (“Contractor”) and the **Spokane Transit Authority** (“Owner”) as of the last date of execution.

Contractor	Owner
Name Address City, State, Zip Contractor License #: UBI #: XXX-XXX-XXX	Spokane Transit Authority 1230 W Boone Ave Spokane, WA 99201

The Contractor and Owner agree as follows:

Project: (project name, location, and description)

Design Professional: (architect or engineer)

Address
City, St, Zip
Contact
Email
Phone

Contract Sum: \$ XXX,XXX.XX Base Bid
 \$ XXX,XXX.XX Alternate 1
 \$ XXX,XXX.XX Alternate 2
 \$ XXX,XXX.XX TOTAL

Unit prices:	<u>Item</u>	<u>Units/limits</u>	<u>Unit Price</u>
	XXX	XXX	XXX
	XXX	XXX	XXX
	XXX	XXX	XXX

(list items by description, the units and limits and the price per unit)

Allowances in Contract Sum:	<u>Item</u>	<u>Units/Limits</u>	<u>Price</u>
	XXX	XXX	XXX
	XXX	XXX	XXX
	XXX	XXX	XXX

(list allowances by description, units and/or limits and the price per unit)

CONTRACT DOCUMENTS

Contract Documents include, but are not limited to:

- A. This Contract executed by the Contractor and Owner;
- B. Advertisement for Bid and all Bid documents;
- C. General Conditions;
- D. Supplemental Conditions;
- E. Drawings prepared by the Design Professional:
 - List the drawing number range from page 1 to XXX and the date(s).
- F. Technical Specifications;
 - List the specifications number range from page 1 to XXX and the date(s).
- G. Invitation for Bid (IFB)
- H. Addenda: (list any/all addenda by number, date and quantity of pages)

<u>Number</u>	<u>Issue Date</u>	<u># of pages</u>
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

- I. Other documents identified as follows:

<u>Description</u>	<u>Date</u>	<u># of pages</u>
XXX	XXX	XXX
XXX	XXX	XXX

PROJECT MANAGERS & COMMUNICATIONS

Any administrative or operational communications required by the Parties' under this Agreement shall be directed to the designated representatives below:

Contractor	Spokane Transit Authority
Contact Title Company Address City, ST ZIP E: email@ P: (509)	Name Capital Projects Manager Spokane Transit Authority 1230 W Boone Ave Spokane, WA 99201 E: @spokanetransit.com P: (509) TBD

Communications to be given hereunder shall be deemed sufficient if given (1) in person; (2) by mail, postage prepaid; or (3) by facsimile or email, addressed to the designated representative of the Parties as set forth above, or as may be revised by written notice in accordance with the Notices Section of this Contract.

NOTICES

All notices, requests, claims, demands and other communications shall be in writing and shall be signed by a person duly authorized to provide such notice. Notices permitted or requested to be given hereunder shall be deemed sufficient if given (1) in person; (2) by regular mail, postage prepaid; (3) by registered or certified mail, postage prepaid, return receipt requested; or (4) by facsimile or email, addressed to the respective contact of the Parties as set forth below, or as may be revised by like notice from time to time.

All notices shall be deemed to have been duly given (1) when delivered in person; (2) three (3) business days after the date of mailing by regular mail, postage prepaid; (3) upon receipt after dispatch by registered or certified mail, postage prepaid; or (4) upon confirmation of receipt when transmitted by facsimile or a read receipt when transmitted by email.

Contractor	Owner
Contact Title Company Address City, ST ZIP E: email@ P: (509) F: (509)	Name Contracts Compliance Specialist Spokane Transit Authority 1230 W Boone Ave Spokane, WA 99201 E: @spokanetransit.com P: (509) TBD F: (509) TBD

[signatures on the following page]

SIGNATURES

The Parties affirm that the individuals signing this Agreement have been granted the authority to do so and by their signature affirm that the Parties will comply with the terms and conditions of this Agreement.

XXX

Spokane Transit Authority

By:
Title:

Date: _____

By: Name
Title: Chief Executive Officer

Date: _____

Attest:

By: Name
Title: Clerk of the Authority

Date: _____

The following Public Works General Conditions (“GC”) are incorporated into the contract to which they are attached. Although these GC are organized consistent with the General Conditions for Washington State Facility Construction, the provisions herein are not identical. Please review these GC carefully.

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PART 1: GENERAL PROVISIONS

1.01 DEFINITIONS

Capitalized terms included in these GC which are not defined herein shall have the same meaning as defined in the document(s) to which these GC are attached.

- A. **Application for Payment** means a written request submitted by Contractor to Owner or, if applicable, A/E for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner or, if applicable, A/E may require.
- B. **Architect, Engineer** or A/E means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.
- C. **Award** means the formal decision by the Owner notifying a responsible Bidder with the lowest responsive Bid of the Owner's acceptance of the Bid and intent to enter into a contract with the Bidder.
- D. **Bidder** means an individual, partnership, firm, corporation or joint venture submitting a Bid with the intent to enter into a contract with Owner for the completion of the Work.
- E. **Business Day** means Monday through Friday, commencing at 12:00 AM and ending at 11:59 PM, unless noted otherwise.
- F. **Change Order** means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.
- G. **Claim** means Contractor's exclusive remedy for resolving disputes with Owner regarding the terms of a Change Order or a request for equitable adjustment, as more fully set forth in Part 8.
- H. **Contract Award Amount** is the sum of the Base Bid and any accepted Alternates.
- I. **Contract Documents** means the Advertisement for Bids, Instructions for Bidders, executed Bid Proposal Form and Bidder certifications, Contract, GC, Modifications to the GC, Federal Terms & Conditions, Drawings, Specifications, all addenda and modifications thereof, all supporting documentation required by any of the above, or as requested by the Owner.
- J. **Contract Sum** is the total amount payable by Owner to Contractor for performance of the Work in accordance with the Contract Documents. Except as described below, the Contract Sum includes all taxes imposed by law and properly chargeable to the Work. The Contract Sum does not include Washington State sales tax.
- K. **Contract Time** is the number of Days allotted in the Contract Documents for achieving Substantial Completion of the Work.
- L. **Contractor** means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents. Contractor's duties and obligations flow down and become duties and obligations of Subcontractors.
- M. **Day(s)** shall mean a calendar day, commencing at 12:00 AM and ending at 11:59 PM, unless noted otherwise.
- N. **Drawings** are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, and may include plans, elevations, sections, details, schedules and diagrams.
- O. **Final Acceptance** means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents, as more fully set forth in Section 6.09E.
- P. **Final Completion** means that the Work is fully and finally complete in accordance with the Contract Documents, as more fully set forth in Section 6.09D.
- Q. **Force Majeure** means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in Section 3.05A.
- R. **L&I** means the State of Washington Department of Labor and Industries.
- S. **Notice** means a written notice which has been delivered to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended or, if delivered or sent by registered or certified mail, to the last business address known to the party giving notice.
- T. **Notice to Proceed** means a written notice from Owner to Contractor that defines the date on which the Contract Time begins to run.

- U. **Owner** means the Spokane Transit Authority, STA or its authorized representative with the authority to enter into, administer and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.
- V. **Person** means a corporation, partnership, business association of any kind, trust, company or individual.
- W. **Prior Occupancy** means Owner's use of all or parts of the Project before Substantial Completion, as more fully set forth in Section 6.08A.
- X. **Progress Schedule** means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Section 3.02B.
- Y. **Project** means the total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by Owner or by separate contractors.
- Z. **Project Manual** means the volume usually assembled for the Work which may include the bidding requirements, sample forms, and other Contract Documents.
- AA. **Project Record** means the separate set of Drawings and Specifications as further set forth in Section 4.02A.
- BB. **Schedule of Values** means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail as requested by Owner.
- CC. **Specifications** are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.
- DD. **Subcontract** means a contract entered into by Subcontractor for the purpose of obtaining supplies, materials, equipment or services of any kind for or in connection with the Work.
- EE. **Subcontractor** means any person, other than Contractor, who agrees to furnish or furnishes any supplies, materials, equipment or services of any kind in connection with the Work.
- FF. **Substantial Completion** means that stage in the progress of the Work when the construction is sufficiently complete, as more fully set forth in Section 6.07A.

- GG. **Work** means the construction and services required by the Contract Documents, and includes, but is not limited to, labor, materials, supplies, equipment, services, permits and the manufacture and fabrication of components, performed, furnished or provided in accordance with the Contract Documents.

1.02 ORDER OF PRECEDENCE

- A. Any conflict or consistency in the Contract Documents shall be resolved by giving the documents precedence in the following order:
1. Federal Terms & Conditions, if applicable.
 2. Executed Change Order(s), in descending order.
 3. Executed Form of Contract.
 4. Supplemental Conditions, if applicable.
 5. Modifications to the GC, if applicable.
 6. GC.
 7. Specifications. Provisions in Division 1 shall take precedence over provisions of any other Division.
 8. Drawings. In case of conflict within the Drawings, large scale drawings shall take precedence over small scale drawings.
 9. Signed and Completed Bid Form.
 10. Instructions to Bidders.
 11. Advertisement for Bids.

1.03 EXECUTION AND INTENT

Contractor makes the following representations to Owner:

- A. **Contract Sum Reasonable.** The Contract Sum is reasonable compensation for the Work and the Contract Time is adequate for the performance of the Work, as represented by the Contract Documents;
- B. **Contractor Familiar with Project.** Contractor has carefully reviewed the Bid Documents, Contract Documents, visited and examined the Project site, become familiar with the local conditions in which the Work is to be performed, and satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the surface and subsurface conditions

and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof;

- C. **Contractor Financially Capable.** Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform Contractor's obligations required by the Contract Documents; and
- D. **Contractor Can Complete Work.** Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform the obligations required by the Contract Documents and has sufficient experience and competence to do so.

PART 2: INSURANCE AND BONDS

2.01 GENERAL INSURANCE REQUIREMENTS

At the Contractor's own expense, the Contractor shall procure and maintain for the duration of the Contract commercial insurance against claims for injuries to persons or damages to property that may arise from or in connection with the Contractor's own work, including the work of the Contractor's agents, representatives, employees, and Subcontractors of any tier. Contractor shall include in its Bid the cost of all insurance and bond costs required to complete the base Bid work and accepted alternates.

- A. **Evidence of Insurance.** Within ten (10) Days of execution of a contract or prior to commencement of the Work, whichever occurs earlier, Contractor shall obtain and provide a Certificate of Insurance evidencing the minimum insurance coverages and limits specified hereunder to Owner at coi@spokanetransit.com. If the Contractor maintains higher limits than those specified herein, the Owner shall be entitled to the higher limits maintained by the Contractor. Owner reserves the right to receive a certified and complete copy of all of the Contractor's insurance policies and the Contractor shall furnish such copies within ten (10) Days of request by Owner. All insurance certificates shall name Owner's Contract number, Project number and Project title.
- B. **Insurer Minimum Requirements.** All insurance policies shall be written with insurance companies licensed to provide insurance in the State of Washington and shall have a rating of not less than A:VII according to the A.M. Best Company.

- C. **Deductible.** The Contractor is responsible for declaring to the Owner and paying any deductible or self-insured retention that is required by any of the Contractor's insurance. If the Owner is required to contribute to the deductible or self-insured retention under any of the Contractor's insurance policies, the Contractor shall reimburse the Owner the full amount of the deductible or self-insured retention.
- D. **Self-insured Retention.** Any Contractor self-insured retentions must be declared to and approved in writing by Owner prior to execution of a Contract. Owner reserves the right to require that self-insured retentions be eliminated, lowered or replaced by a deductible. Self-insurance or self-insured retentions will not be considered to comply with these insurance requirements unless specifically approved in writing by Owner.
- E. **Owner as Additional Insured.** Owner shall be named as an additional insured on the Contractor's commercial general liability, umbrella liability and business auto liability policies and shall contain, or be endorsed to contain, that the Owner, it's officers, officials, employees and volunteers, are to be covered as insureds with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of the Contractor, and with respect to liability arising out of work or operations performed by or on behalf of the Contractor including material, parts or equipment furnished in connection with such work or operations. The Owner shall be endorsed as a loss payee on the Contractor's builders' risk and boiler and machinery policies.
- F. **Primary and Non-contributory.** It is the intent of the Contract for the Contractor's insurance to be considered primary in the event of a loss, damage or suit. The Owner's own comprehensive general liability policy will be considered excess coverage in respect to the Owner, its officers, officials, employees, and volunteers, and shall not contribute to the Contractor. Additionally, the Contractor's commercial general liability policy must provide cross-liability coverage as would be achieved under a standard ISO separation of insureds clause.
- G. **Notification.** The Contractor shall request from its insurer modification of the ACORD certificates to include language that written notification will be given to the Owner for any cancellation, suspension or material change in the Contractor's coverages at least thirty (30) Days in advance of such cancellation, suspension or material change.

- H. **Term of Insurance Coverage.** Contractor shall maintain insurance coverages herein during the Work and for two (2) years after Final Acceptance. Contractor shall also maintain such insurance coverage during the performance of any corrective Work required by Section 5.16.
- I. **Subcontractor Coverage.** Contractor shall require and verify all Subcontractors maintain insurance meeting all of the requirements stated herein.
- J. **Waiver of Subrogation Rights.** Owner and Contractor waive all subrogation rights against each other, any Subcontractors, A/E, A/E's subconsultants, separate contractors, if any, and any of their subcontractors, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Section or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by Owner as fiduciary. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

2.02 MINIMUM INSURANCE COVERAGES

- A. **General Liability Insurance.** Commercial General Liability (CGL) insurance on a project-occurrence basis, with coverage at least as broad as ISO form CG 00 01 with minimum limits of \$2,000,000 per occurrence and \$4,000,000 in the aggregate. Coverage shall include, but not be limited to:
1. Premise/operations;
 2. Contractual liability;
 3. Products & completed operations;
 4. Independent contractors
 5. Property damage; and
 6. Personal injury/advertising injury
- B. **Automobile Liability Insurance.** Commercial automobile liability insurance on a Combined Single Limit basis at least as broad as ISO form CA 00 01 with minimum limits of \$2,000,000 per occurrence.

- C. **Industrial Insurance.** Contractor shall comply with the Washington State Industrial Insurance Act and, if applicable, the Federal Longshoremen's and Harbor Workers' Act and the Jones Act.
- D. **Builder's Risk.** Builder's Risk coverage on a replacement-cost basis, at an amount equal to the initial Contract Sum and any subsequent Change Orders, plus twenty-five percent (25%) for additional architectural and engineering services. This property insurance shall cover, at a minimum, malicious mischief, false work, temporary buildings, debris removal including demolition occasioned by enforcement of any applicable legal requirements, reasonable compensation for Owner's and, if applicable, A/E's services and expenses required as a result of an insured loss, perils insured under the ISO special cause of loss form CP 10 30 and shall be endorsed to provide full coverage for loss or damage from collapse, including collapse resulting from design error. The policy shall cover reasonable compensation for architects' and/or engineers' services and expenses made necessary by an insured loss. Insured property shall include portions of the Work located away from the work site, but intended for use at the work site, and shall cover portions of the Work in transit. The policy shall cover the cost of removing debris, including demolition as may be legally necessary by any law, ordinance or regulation.

The builders risk policy shall be maintained in effect, unless otherwise provided for in the Contract Documents, until the earliest of the following dates: (a) the date on which all persons and organizations who are insureds on the policy agree it shall be terminated; (b) the date on which final payment has been made; (c) the date on which the insurable interests in the property of all insureds other than the Owner have ceased.

- E. For projects not involving construction of a new building, an "Installation Floater" is an acceptable substitute for Builder's Risk Insurance. The Installation Floater shall cover all interests of the Owner, Contractor and any Subcontractors, as their interests may appear, for the duration of the Project.

- F. **Boiler & Machinery.** When applicable, Contractor shall purchase and maintain boiler and machinery coverage covering insured objects during installation and until Final Acceptance by Owner. This insurance shall name as insureds the Owner, Contractor, and all Subcontractors of any tier.

2.03 PAYMENT AND PERFORMANCE BONDS

- A. Payment and performance bonds for one hundred percent (100%) of the Contract Award Amount plus state sales tax, shall be furnished for the Work, using the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312 (or current version of the same). Prior to execution of a Change Order that, cumulatively with previous Change Orders, increases the Contract Award Amount by fifteen percent (15%) or more, the Contractor shall provide either new payment and performance bonds for the revised Contract Sum, or riders to the existing payment and performance bonds increasing the amount of the bonds. The Contractor shall likewise provide additional bonds or riders when subsequent Change Orders increase the Contract Sum by fifteen percent (15%) or more.
- B. No payment or performance bond is required if the Contract Sum is \$150,000 (one-hundred fifty thousand dollars) or less and Contractor agrees in writing that Owner may, in lieu of the bond, retain ten percent (10%) of the Contract Sum for the period allowed by RCW 39.08.010.
- C. **Alternative Surety.** Contractor shall promptly furnish payment and performance bonds from an alternative surety as required to protect Owner and persons supplying labor or materials required by the Contract Documents if:
1. Owner has a reasonable objection to the surety; or
 2. Any surety fails to furnish reports on its financial condition if requested by Owner.

PART 3: TIME AND SCHEDULE

3.01 PROGRESS AND COMPLETION

Contractor shall diligently execute the Work, with adequate forces, achieve Substantial Completion within the Contract Time, and achieve Final Completion within a reasonable period thereafter.

3.02 CONSTRUCTION SCHEDULE

- A. **Preliminary Progress Schedule.** Unless otherwise provided in the Contract, Supplemental Conditions, or Modifications to GC, Contractor shall, within fourteen (14) Days after issuance of the Notice to Proceed, submit a preliminary Progress Schedule. The Progress Schedule shall show the sequence in which Contractor proposes to perform the Work, and the dates on which Contractor plans to start and finish major portions of the Work, including dates for shop drawings and other submittals, and for acquiring materials and equipment.
- B. **Form of Progress Schedule.** The Progress Schedule shall be created, maintained and edited using MS Project software or similar software identified and agreed to by and between the parties. The scheduling of construction is the responsibility of the Contractor and is included in the Contract to assure adequate planning and execution of the Work. The schedule will be used to evaluate progress of the Work for payment based on the Schedule of Values. The schedule shall show the Contractor's planned order and interdependence of activities, and sequence of work. At a minimum, the schedule shall include:
- Date of Notice to Proceed;
 - Activities (resources, durations, individual responsible for activity, early starts, late starts, early finishes, late finishes, etc.);
 - Utility Shutdowns;
 - Interrelationships and dependence of activities;
 - Planned vs. actual status for each activity;
 - Substantial Completion;
 - Punch list;
 - Final inspection;
 - Final Completion, and
 - Float time.

The Schedule Duration shall be based on the Contract Time of Completion listed on the Bid Proposal Form. The Owner shall not be obligated to accept any Early Completion Schedule suggested by the Contractor. The Contract Time for Completion shall establish the Schedule Completion Date.

If the Contractor feels that the Work can be completed in less than the specified Contract

Time, then the surplus time shall be considered Project Float. This Project Float time shall be shown on the Project Schedule. It shall be available to accommodate changes in the Work and unforeseen conditions.

Neither the Contractor nor the Owner have exclusive right to this Float Time. It belongs to the Project.

- C. **Owner Comments on Progress Schedule.** Owner shall return comments on the preliminary Progress Schedule to Contractor within fourteen (14) Days of receipt. Review by Owner of Contractor's schedule does not constitute an approval or acceptance of Contractor's construction means, methods or sequencing, or its ability to complete the Work within the Contract Time. Contractor shall revise and resubmit its schedule, as necessary. Owner may withhold a portion of progress payments until a Progress Schedule has been submitted which meets the requirements of this Section.
- D. **Monthly Updates and Compliance with Progress Schedule.** Contractor shall utilize and comply with the Progress Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Progress Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Progress Schedule for reasons other than acts of Force Majeure as identified in Section 3.05A, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Progress Schedule, and if directed by Owner, Contractor shall submit a corrective action plan or revise the Progress Schedule to reconcile with the actual progress of the Work.
- E. **Contractor to Notify Owner of Delays.** Contractor shall promptly notify Owner in writing of any actual or anticipated event which is delaying or could delay achievement of any milestone or performance of any critical path activity of the Work. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Progress Schedule, and the action being or to be taken to correct the problem. Provision of such notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

3.03 OWNER'S RIGHT TO SUSPEND THE WORK FOR CONVENIENCE

- A. **Owner May Suspend Work.** Owner may, at its sole discretion, order Contractor, in writing, to suspend all or any part of the Work for up to ninety (90) Days, or for such longer period as mutually agreed.
- B. **Compliance with Suspension; Owner's Options.** Upon receipt of a written notice suspending the Work, Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of cost of performance directly attributable to such suspension. Within a period up to ninety (90) Days after the notice is delivered to Contractor, or within any extension of that period to which the parties shall have agreed, Owner shall either:
1. Cancel the written notice suspending the Work; or
 2. Terminate the Work covered by the notice as provided in the termination provisions of Part 9.
- C. **Resumption of Work.** If a written notice suspending the Work is cancelled or the period of the notice or any extension thereof expires, Contractor shall resume Work.
- D. **Equitable Adjustment for Suspensions.** Contractor shall be entitled to an equitable adjustment in the Contract Time, or Contract Sum, or both, for increases in the time or cost of performance directly attributable to such suspension, provided Contractor complies with all requirements set forth in Part 7.

3.04 OWNER'S RIGHT TO STOP THE WORK FOR CAUSE

- A. **Owner May Stop Work for Contractor's Failure to Perform.** If Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, Owner may order Contractor, in writing, to stop the Work, or any portion thereof, until satisfactory corrective action has been taken.
- B. **No Equitable Adjustment for Contractor's Failure to Perform.** Contractor shall not be entitled to an equitable adjustment in the Contract Time or Contract Sum for any increased cost or time of performance attributable to Contractor's failure or refusal to perform or from any reasonable remedial action taken by Owner based upon such failure.

- C. **Opportunity to Cure.** Owner, in its sole discretion, may, in the case of termination for breach or default, allow the Contractor an appropriate period of time, as determined by Owner, in which to cure the defect of goods or service. In such case, the notice of termination will state the nature of the breach or default, the time period in which cure is permitted and other appropriate conditions. If the Contractor fails to remedy to Owner's satisfaction the breach or default of any of the terms, covenants or conditions of the Contract Documents within the stated period of time for remedy, Owner shall have the right to terminate the Contract without any further obligation to the Contractor. Any such termination for default shall not in any way operate to preclude Owner from also pursuing all available legal remedies against the Contractor and its sureties for said breach or default.
- D. **Waiver of Remedies for Any Breach.** In the event that Owner elects to waive its remedies for any breach by the Contractor of any covenant, term or condition of this Contract, such waiver by Owner shall not limit Owner's legal remedies for any succeeding breach of that or of any other term, covenant, or condition of this contract.

3.05 DELAY

- A. **Force Majeure Actions Not A Default; Force Majeure Defined.** Any delay in or failure of performance by Owner or Contractor, other than the payment of money, shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party ("Force Majeure"). Acts of Force Majeure include, but are not limited to:
1. Acts of God or the public enemy;
 2. Acts or omissions of any government entity;
 3. Fire or other casualty for which Contractor is not responsible;
 4. Quarantine or epidemic;
 5. Strike or defensive lockout;
 6. Unusually severe weather, in excess of weather conditions experienced within the area any time in the preceding ten (10) years:
 - a. Monthly rainfall in excess of the highest monthly rainfall experienced for the same month.

- b. Annual rainfall in excess of the highest annual rainfall experienced.
 - c. Monthly snowfall in excess of the highest monthly snowfall experienced for the same month.
 - d. Annual snowfall in excess of the highest annual snowfall experienced.
 - e. Average high temperatures, for the summer months, in excess of the highest temperatures experienced.
 - f. Average low temperatures for the winter months, lower than the lowest average temperatures experienced.
7. Unusual delay in receipt of supplies or products which were ordered and expedited and for which no substitute reasonably acceptable to Owner was available.
- B. **Contract Time Adjustment For Force Majeure.** Contractor shall be entitled to an equitable adjustment in the Contract Time for changes in the time of performance directly attributable to an act of Force Majeure, provided it makes a request for equitable adjustment according to Section 7.03. Contractor shall not be entitled to an adjustment in the Contract Sum resulting from an act of Force Majeure.
- C. **Contract Time or Contract Sum Adjustment If Owner at Fault.** Contractor shall be entitled to an equitable adjustment in Contract Time, and may be entitled to an equitable adjustment in Contract Sum, if the cost or time of Contractor's performance is changed due to the fault or negligence of Owner, provided the Contractor makes a request according to Sections 7.02 and 7.03.
- D. **No Contract Time or Contract Sum Adjustment If Contractor at Fault.** Contractor shall not be entitled to an adjustment in Contract Time or in the Contract Sum for any delay or failure of performance to the extent such delay or failure was caused by Contractor or anyone for whose acts Contractor is responsible.
- E. **Contract Time Adjustment Only for Concurrent Fault.** To the extent any delay or failure of performance was concurrently caused by the Owner and Contractor, Contractor shall be entitled to an adjustment in the Contract Time for that portion of the delay or failure of performance that was concurrently caused, provided it makes a request for equitable adjustment according to

Section 7.03, but shall not be entitled to an adjustment in Contract Sum.

- F. **Contractor to Mitigate Delay Impacts.** Contractor shall make all reasonable efforts to prevent and mitigate the effects of any delay, whether occasioned by an act of Force Majeure or otherwise.

3.06 NOTICE TO OWNER OF LABOR DISPUTES

- A. **Contractor to Notify Owner of Labor Disputes.** If Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay timely performance in accordance with the Contract Documents, Contractor shall immediately give notice, including all relevant information, to Owner.
- B. **Pass Through Notification Provisions to Subcontractors.** Contractor agrees to insert a provision in its Subcontracts and to require insertion in all Subcontractor subcontracts, that in the event timely performance of any such contract is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor or its subcontractors shall immediately notify the next higher tier Subcontractor or Contractor, as the case may be, of all relevant information concerning the dispute.

3.07 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

- A. **Liquidated Damages**
1. **Reason for Liquidated Damages.** Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence. Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. However, it would be difficult if not impossible to determine the exact amount of such damages. Consequently, provisions for liquidated damages are included in the Contract Documents.
 2. **Calculation of Liquidated Damages Amount.** The liquidated damage amounts set forth in the Contract Documents will be assessed not as a penalty, but as liquidated damages for breach of the Contract Documents. This amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and

extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. This amount shall be construed as the actual amount of damages sustained by the Owner and may be retained by the Owner and deducted from periodic payments to the Contractor.

3. **Contractor Responsible Even If Liquidated Damages Assessed.** Assessment of liquidated damages shall not release Contractor from any further obligations or liabilities pursuant to the Contract Documents.

B. **Actual Damages**

1. **Calculation of Actual Damages.** Actual damages will be assessed for failure to achieve Final Completion within the time provided. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributable to the Project from the date when Final Completion should have been achieved, based on the date Substantial Completion is actually achieved, to the date Final Completion is actually achieved. Owner may offset these costs against any payment due Contractor.

PART 4: SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.01 DISCREPANCIES AND CONTRACT DOCUMENT REVIEW

- A. **Specifications and Drawings Are Basis of The Work.** The intent of the Specifications and Drawings is to describe a complete Project to be constructed in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, tools, transportation, permits and supplies, and perform the Work required in accordance with the Drawings, Specifications and other provisions of the Contract Documents.
- B. **Parts of The Contract Documents Are Complementary.** The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.

- C. **Contractor to Report Discrepancies in Contract Documents.** Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Owner. If, during the performance of the Work, Contractor finds a conflict, error, inconsistency or omission in the Contract Documents, it shall promptly and before proceeding with the Work affected thereby, report such conflict, error, inconsistency or omission to Owner and, if applicable, A/E in writing.
- D. **Contractor Knowledge of Discrepancy in Documents – Responsibility.** Contractor shall do no Work without applicable Drawings, Specifications or written modifications, or Shop Drawings where required, unless instructed to do so in writing by Owner. If Contractor performs any construction activity and it knows or reasonably should have known that any of the Contract Documents contain a conflict, error, inconsistency or omission, Contractor shall be responsible for the performance and shall bear the cost for its correction.
- E. **Contractor to Perform Work Implied by Contract Documents.** Contractor shall provide any work or materials the provision of which is clearly implied and is within the scope of the Contract Documents even if the Contract Documents do not mention them specifically.
- F. **Interpretation Questions Referred to Owner.** Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the Owner and, if applicable, the A/E.

4.02 PROJECT RECORD

- A. **Contractor to Maintain Project Record Drawings and Specifications.** Contractor shall legibly mark in ink on a separate set of the Drawings and Specifications all actual construction which differ from the project Drawings and Specifications, including, but not limited to, depths of foundations, horizontal and vertical locations of internal and underground utilities and appurtenances referenced to permanent visible and accessible surface improvements, field changes with dimensions and details, actual suppliers, manufacturers and trade names, models of installed equipment, and Change Order Proposals (“COP”). This separate set of Drawings and Specifications shall be the “Project Record”.

- B. **Update Project Record Weekly and Keep on Site.** The Project Record shall be maintained on the Project site throughout the construction and shall be clearly labeled “PROJECT RECORD”. The Project Record shall be updated at least weekly noting all changes and shall be available to Owner at all times.
- C. **Final Project Record to Owner Before Final Acceptance.** Contractor shall submit the completed and finalized Project Record to Owner prior to Final Acceptance.

4.03 SHOP DRAWINGS

- A. **Definition of Shop Drawings.** “Shop Drawings” means documents and other information required to be submitted to Owner and by Contractor pursuant to the Contract Documents, showing in detail: the proposed fabrication and assembly of structural elements; and the installation (i.e. form, fit, and attachment details) of materials and equipment. Shop Drawings include, but are not limited to, drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, samples and similar materials furnished by Contractor to explain in detail specific portions of the Work required by the Contract Documents. For materials and equipment to be incorporated into the Work, Contractor submittal shall include the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature and rating of the item. When directed, Contractor shall submit all samples at its own expense. Owner may duplicate, use and disclose Shop Drawings provided in accordance with the Contract Documents.
- B. **Approval of Shop Drawings by Contractor and Owner.** Contractor shall coordinate all Shop Drawings and review them for accuracy, completeness and compliance with the Contract Documents, and shall indicate its approval thereon as evidence of such coordination and review. Where required by law, Shop Drawings shall be stamped by an appropriate professional licensed by the state of Washington. Shop Drawings submitted to Owner without evidence of Contractor’s approval shall be returned for resubmission. Contractor shall review, approve and submit Shop Drawings with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or separate contractors. Contractor’s submittal schedule shall allow a reasonable time for Owner and, if applicable, A/E review. Owner and, if

applicable, A/E, will review, approve or take other appropriate action on the Shop Drawings. Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings until the respective submittal has been reviewed and the Owner and, if applicable, A/E, has approved or taken other appropriate action. Owner and, if applicable, A/E, shall respond to Shop Drawing submittals with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Shop Drawings. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.

- C. **Contractor Not Relieved of Responsibility When Shop Drawings Approved.** Approval, or other appropriate action with regard to Shop Drawings, by Owner and, if applicable, A/E, shall not relieve Contractor of responsibility for any errors or omissions in such Shop Drawings, nor from responsibility for compliance with the requirements of the Contract Documents. Unless specified in the Contract Documents, review by Owner and, if applicable, A/E, shall not constitute an approval of the safety precautions employed by Contractor during construction, or constitute an approval of Contractor's means or methods of construction. If Contractor fails to obtain approval before installation, and the item or work is subsequently rejected, Contractor shall be responsible for all costs of correction.
- D. **Variations Between Shop Drawings and Contract Drawings.** If Shop Drawings show variations from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Shop Drawings, at the time it submits the Shop Drawings containing such variations. If Owner and, if applicable, A/E, approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be recorded upon the Project Record.
- E. **Contractor to Submit Shop Drawings.** Unless otherwise provided in Division 1, Contractor shall submit to Owner and, if applicable, A/E, for approval three (3) original paper copies and an electronic copy in PDF format of all Shop Drawings. Unless otherwise indicated, one (1) original copy of all Shop Drawings shall be retained by Owner; one (1) original copy shall be

retained by A/E; and one (1) original copy shall be returned to Contractor.

4.04 ORGANIZATION OF SPECIFICATIONS

- A. **Specification Organization by Trade.** Specifications are prepared in sections which conform generally with trade practices. These sections are for Owner and Contractor convenience and shall not control Contractor in dividing the Work among the Subcontractors or in establishing the extent of the Work to be performed by any trade.

4.05 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS

- A. **Owner Or, If Applicable, A/E, Not Contractor, Owns Copyright of Drawings and Specifications.** The Drawings, Specifications and other documents prepared by Owner or, if applicable, A/E, (the "Preparer") are instruments of Preparer's service through which the Work to be executed by Contractor is described. Neither Contractor nor any Subcontractor shall own or claim a copyright in the Drawings, Specifications and other documents prepared by Preparer, and Preparer shall be deemed the author of them and will, along with any rights of Owner, retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of these documents, except Contractor's set, shall be returned or suitably accounted for to Owner or, if applicable, A/E, on request, upon completion of the Work.
- B. **Drawings and Specifications to Be Used Only for This Project.** The Drawings, Specifications and other documents prepared by the Owner or, if applicable, A/E, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner and, if applicable, A/E. Contractor and Subcontractors are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by Owner or, if applicable, A/E, appropriate to and for use in the execution of their Work.
- C. **Shop Drawing License Granted to Owner.** Contractor and all Subcontractors grant a non-exclusive license to Owner, without additional

cost or royalty, to use for its own purposes (including reproduction) all Shop Drawings, together with the information and diagrams contained therein, prepared by Contractor or any Subcontractor. In providing Shop Drawings, Contractor and all Subcontractors warrant that they have authority to grant to Owner a license to use the Shop Drawings, and that such license is not in violation of any copyright or other intellectual property right. Contractor agrees to defend and indemnify Owner pursuant to the indemnity provisions in Sections 5.03A and 5.22 from any violations of copyright or other intellectual property rights arising out of Owner's use of the Shop Drawings hereunder, or to secure for Owner, at Contractor's own cost, licenses in conformity with this Section.

- D. **Shop Drawings to Be Used Only for This Project.** The Shop Drawings and other submittals prepared by Contractor, Subcontractors of any tier, or its or their equipment or material suppliers, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor of any tier, or material or equipment supplier, on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner. The Contractor, Subcontractors of any tier, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Shop Drawings and other submittals appropriate to and for use in the execution of their Work under the Contract Documents.

PART 5: PERFORMANCE

5.01 CONTRACTOR CONTROL AND SUPERVISION

- A. **Contractor Responsible for Means and Methods of Construction.** Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the Work in a skillful manner. 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, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.
- B. **Competent Superintendence Required.** Performance of the Work shall be directly supervised by a competent superintendent who

has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, if Owner reasonably deems the superintendent incompetent, careless or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition.

- C. **Contractor Responsible for Acts and Omissions of Self and Agents.** Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors and their employees and agents.
- D. **Contractor to Employ Competent and Disciplined Workforce.** Contractor shall enforce strict discipline and good order among all of the Contractor's employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal and nondiscriminatory treatment of all persons. Owner may, by written notice, request Contractor to remove from the Work or Project site any employee Owner reasonably deems incompetent, careless or otherwise objectionable.
- E. **Contractor to Keep Project Documents on Site.** Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings and permits, permit drawings and life safety plans as may be required by federal, state and local agencies.
- F. **Contractor to Comply with Ethical Standards.** Contractor shall ensure that its owner(s) and employees, and those of its Subcontractors, comply with the Ethics in Public Service Act, RCW 42.52, which, among other things, prohibits state employees from having an economic interest in any public works contract that was made by, or supervised by, that employee. Contractor shall remove, at its sole cost and expense, any of its, or its Subcontractors' employees if they are in violation of this act.

5.02 PERMITS, FEES, AND NOTICES

- A. **Contractor to Obtain and Pay for Permits.** Unless otherwise provided in the Contract Documents, Contractor shall pay for and obtain all permits, licenses and inspections necessary for proper execution and completion of the Work.

Upon issuance of a permit or license, a copy shall be provided to the Owner. Prior to Final Acceptance, the original approved and signed permits shall be delivered to Owner.

- B. **Allowances for Permit Fees.** If allowances for permits or utility fees are called for in the Contract Documents and set forth in Contractor's Bid, and the actual costs of those permits or fees differ from the allowances in the Contract Documents, the difference shall be adjusted by Change Order.
- C. **Contractor to Comply with All Applicable Laws.** Contractor shall comply with and give notices required by all federal, state and local laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work.

5.03 PATENTS AND ROYALTIES

- A. **Payment, Indemnification and Notice.** Contractor is responsible for and shall pay all royalties and license fees. Contractor shall defend, indemnify and hold Owner harmless from any costs, expenses and liabilities arising out of the infringement by Contractor and/or its Subcontractors, of any tier, of any patent, copyright or other intellectual property right used in the Work; however, provided that Contractor gives prompt notice, Contractor shall not be responsible for such defense or indemnity when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. If Contractor has reason to believe that use of the required design, process or product constitutes an infringement of a patent or copyright, it shall promptly notify Owner of such potential infringement in writing.

5.04 PREVAILING WAGES

- A. **Contractor to Pay Prevailing Wages.** Contractor and Subcontractors of any tier shall pay the prevailing rate of wages to all workers, laborers or mechanics employed in the performance of any part of the Work in accordance with RCW 39.12 *Prevailing Wages on Public Works*, the rules and regulations of L&I, and where applicable, the Davis-Bacon and Related Acts. The schedule of prevailing wage rates for the locality or localities of the Work is determined by the Industrial Statistician of L&I. Such schedule is located at: <https://secure.lni.wa.gov/wagelookup>. Contractor shall use the Bid Due Date as the

effective date and Spokane County as the locality of work when determining applicable prevailing wage rates. A copy of applicable prevailing wage rates is available for viewing upon request at Spokane Transit Authority, 1230 W. Boone Ave., Spokane, WA 99201. It is the Contractor's responsibility to verify the applicable state and federal prevailing wage rates for all job classifications.

- B. **Statement of Intent to Pay Prevailing Wage.** Before payment is made by the Owner to the Contractor for any work performed by the Contractor and subcontractors whose work is included in the Application for Payment, the Contractor shall submit, or shall have previously submitted to the Owner for the Project, a Statement of Intent to Pay Prevailing Wages ("Intent"), approved by L&I, certifying the rate of hourly wage to be paid to each classification of laborers, workers or mechanics employed upon the Work by Contractor and Subcontractors of any tier. Such rates of hourly wage shall not be less than the prevailing wage rate.
- C. **Affidavit of Wages Paid.** Prior to release of retainage or, where applicable, bond, the Contractor shall submit to the Owner an Affidavit of Wages Paid ("Affidavit"), approved by L&I, for the Contractor and every subcontractor, of any tier, that performed work on the Project.
- D. **Statement with Pay Application.** Each Application for Payment submitted by Contractor shall state that prevailing wages have been paid in accordance with the pre-filed and approved Intent.
- E. **Post Statements of Intent at Job Site.** Copies of the approved Intent(s) shall be posted on the job site with the address and telephone number of the Industrial Statistician of L&I where a complaint or inquiry concerning prevailing wages may be made.
- F. **Contractor to Pay for Statements of Intent and Affidavits.** In compliance with chapter 296-127 WAC, Contractor and Subcontractors of any tier shall pay to L&I the currently established fee(s) for each Intent and/or Affidavit submitted to L&I for certification.
- G. **Certified Payrolls.** Consistent with RCW 39.12.120 and WAC 296-127-320, the Contractor and Subcontractors of any tier shall keep accurate payroll records for three (3) years from the date of Final Acceptance of the Project and submit certified payroll records using L&I's online system at least once per month. If L&I's online

system is not used, Contractor and Subcontractors of any tier shall file a copy of its certified payroll records directly with L&I in a format approved by L&I at least once per month. A Contractor's and/or Subcontractor's noncompliance with this Section constitutes a violation of RCW 39.12.050.

- H. **Dispute Resolution.** Any dispute regarding prevailing wage rates that cannot be resolved between the parties shall be referred to the Director of L&I and such decision of the Director of L&I shall be final and conclusive and binding on the parties.
- I. **Compliance with Federal Funding Requirements.** When the Project is subject to Federal Assistance, Contractor and Subcontractors of any tier shall comply with all requirements of the Davis Bacon and Related Acts. In the event the Project is subject to both State of Washington Prevailing Wages and Davis Bacon and Related Acts, the greater of the two prevailing wage rates shall be paid on a classification by classification basis.

5.05 HOURS OF LABOR

- A. **Overtime.** Contractor shall comply with all applicable provisions of RCW 49.28, which are incorporated herein by reference. Pursuant to that statute, no laborer, worker or mechanic employed by Contractor, any Subcontractor, or any other person performing or contracting to do the whole or any part of the Work, shall be permitted or required to work more than eight (8) hours in any one (1) calendar day, provided, that in cases of extraordinary emergency, such as danger to life or property, the hours of work may be extended, but in such cases the rate of pay for time employed in excess of eight (8) hours of each calendar day shall be not less than one and one-half (1-1/2) times the rate allowed for this same amount of time during eight (8) hours of service.
- B. **4-10 Agreements.** Notwithstanding the preceding Section, RCW 49.28 permits a contractor or subcontractor in any public works contract subject to those provisions, to enter into an agreement with its employees in which the employees work up to ten (10) hours in a calendar day. No such agreement may provide that the employees work ten (10) hour days for more than four (4) calendar days a week. Any such agreement is subject to approval by the employees. The overtime provisions of RCW 49.28 shall not apply to the hours, up to forty (40) hours per week, worked pursuant to any such agreement.

5.06 NONDISCRIMINATION

- A. **Discrimination Prohibited by Applicable Laws.** Discrimination in all phases of employment is prohibited by, among other laws and regulations, Title VI of the Civil Rights Act, Title VII of the Civil Rights Act of 1964, the Vietnam Era Veterans Readjustment Act of 1974, Sections 503 and 504 of the Vocational Rehabilitation Act of 1973, the Equal Employment Act of 1972, the Age Discrimination Act of 1975, Section 202 of the Americans with Disabilities Act of 1990, the Civil Rights Act of 1991, Presidential Executive Order 11246, Executive Order 11375, Executive Order 13672, Federal Transit law at 49 U.S.C. § 5332, the Washington State Law Against Discrimination, RCW 49.60, and Gubernatorial Executive Order 85-09. These laws and regulations establish minimum requirements for affirmative action and fair employment practices which Contractor and Subcontractors must meet.

B. **During performance of the Work:**

1. **Protected Classes.** Contractor shall not discriminate against any employee or applicant for employment because of race, creed, religion, color, national origin, sex, age, marital status, sexual orientation, gender identity, or the presence of any physical, sensory or mental disability, Vietnam era veteran status, or disabled veteran status, nor commit any other unfair practices as defined in RCW 49.60 and prohibited under state and federal law.
2. **Advertisements to State Nondiscrimination.** Contractor shall, in all solicitations or advertisements for employees placed by or for it, state that all qualified applicants will be considered for employment, without regard to race, creed, religion, color, national origin, sex, age, marital status, sexual orientation, gender identity, or the presence of any physical, sensory, or mental disability.
3. **Contractor to Notify Unions and Others of Nondiscrimination.** Contractor shall send to each labor union, employment agency, or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the labor union, employment agency, or workers' representative of Contractor's obligations according to the Contract

Documents, RCW 49.60, and state and federal prohibitions against discrimination.

4. **Owner and Government Access to Contractor Records.** Contractor shall permit access to its books, records and accounts, and to its premises by Owner, the Equal Employment Opportunity Commission, and the Washington State Human Rights Commission, for the purpose of investigation to ascertain compliance with this Section of the Contract Documents.
5. **Pass Through Provisions to Subcontractors.** Contractor shall include the provisions of this Section in every Subcontract and shall require Subcontractors to include the provisions of this Section in all contracts for the Project.

5.07 SAFETY PRECAUTIONS

- A. **Contractor Responsible for Safety.** Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Work.
- B. **Contractor Safety Responsibilities.** In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the Work and other persons who may be affected by the Work; prevent damage to materials, supplies and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; shall erect and maintain all necessary safeguards for such safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the Work may affect them.
- C. **Contractor to Maintain Safety Records.** Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease or damage to property, materials, supplies or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.
- D. **Contractor to Provide Hazmat Information and Training.** Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals

in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.

1. **Information.** At a minimum, Contractor shall inform persons working on the Project site of:
 - a. **WAC Requirements.** The requirements of chapter 296-62 WAC, General Occupational Health Standards;
 - b. **Presence of Hazardous Chemicals.** Any operations in their work area where hazardous chemicals are present; and
 - c. **Hazard Communications Program.** The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.
2. **Training.** At a minimum, Contractor shall provide training for persons working on the Project site which includes, but is not limited to:
 - a. **Detecting Hazardous Chemicals.** Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
 - b. **Hazards of Chemicals.** The physical and health hazards of the chemicals in the work area;
 - c. **Protection from Hazards.** The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, its Subcontractors or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures and personal protective equipment to be used; and

- d. **Hazard Communications Program.** The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.
- E. **Hazardous, Toxic or Harmful Substances.** Contractor's responsibility for hazardous, toxic or harmful substances shall include the following duties:
1. **Illegal Use of Dangerous Substances.** Contractor shall not keep, use, dispose, transport, generate or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous or harmful by any federal, state or local law, regulation, statute or ordinance (hereinafter collectively referred to as "hazardous substances") in violation of any such law, regulation, statute or ordinance, but in no case shall any such hazardous substance be stored more than ninety (90) Days on the Project site.
 2. **Contractor Notifications of Spills, Failures, Inspections, Citations and Fines.** Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state or local law, regulation or ordinance; all inspections of the Project site by any regulatory entity concerning the same; any citation; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.
- F. **Public Safety and Traffic.** All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor's responsibility. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.
- G. **Contractor to Act in an Emergency.** In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.
- H. **No Duty of Safety by Owner or A/E.** Nothing provided in this Section shall be construed as imposing any duty upon Owner and, if applicable, A/E, with regard to, or as constituting any express or implied assumption of control or responsibility over, Project site safety, or over any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public.
- 5.08 **OPERATIONS, MATERIAL HANDLING, AND STORAGE AREAS**
- A. **Limited Storage Areas.** Contractor shall confine all operations, including storage of materials, to Owner-approved areas.
- B. **Temporary Buildings and Utilities at Contractor Expense.** Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be provided by Contractor only with the consent of Owner and without expense to Owner. The temporary buildings and utilities shall be removed by Contractor at its expense upon completion of the Work.
- C. **Roads and Vehicle Loads.** Contractor shall use only established roadways or temporary roadways authorized by Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state or local law or regulation.
- D. **Ownership and Reporting by Contractor of Demolished Materials.** Ownership and control of all materials or facility components to be demolished or removed from the Project site by Contractor shall immediately vest in Contractor upon severance of the component from the facility or severance of the material from the Project site. Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal. Contractor shall provide Owner with a copy of all manifests and receipts evidencing proper disposal when required by Owner or applicable law.

- E. **Contractor Responsible for Care of Materials and Equipment On-Site.** Contractor shall be responsible for the proper care and protection of its materials and equipment delivered to the Project site. Materials and equipment may be stored on the premises subject to approval of Owner. When Contractor uses any portion of the Project site as a shop, Contractor shall be responsible for any repairs, patching or cleaning arising from such use.

- F. **Contractor Responsible for Loss of Materials and Equipment.** Contractor shall protect and be responsible for any damage or loss to the Work, or to the materials or equipment until the date of Substantial Completion, and shall repair or replace without cost to Owner any damage or loss that may occur, except damages or loss caused by the acts or omissions of Owner. Contractor shall also protect and be responsible for any damage or loss to the Work, or to the materials or equipment, after the date of Substantial Completion, and shall repair or replace without cost to Owner any such damage or loss that might occur, to the extent such damages or loss are caused by the acts or omissions of Contractor, or any Subcontractor.

5.09 PRIOR NOTICE OF EXCAVATION

- A. **Excavation Defined.** "Excavation" means an operation in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means, except the tilling of soil less than twelve (12) inches in depth for agricultural purposes, or road ditch maintenance that does not change the original road grade or ditch flow line.
- B. **Use of Locator Services.** Before commencing any excavation, Contractor shall provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities, through locator services.

5.10 UNFORESEEN PHYSICAL CONDITIONS

- A. **Notice Requirement for Concealed or Unknown Conditions.** If Contractor encounters conditions at the site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature which 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, then Contractor shall give written notice to Owner promptly and in no event later than seven (7) Days after the first observance of the conditions. Conditions shall not be disturbed prior to such notice.

- B. **Adjustment in Contract Time and Contract Sum.** If such conditions differ materially and cause a change in Contractor's cost of, or time required for, performance of any part of the Work, the Contractor may be entitled to an equitable adjustment in the Contract Time or Contract Sum, or both, provided it makes a request therefore as provided in Part 7.

5.11 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, VEGETATION, UTILITIES, AND IMPROVEMENTS

- A. **Contractor to Protect and Repair Property.** Contractor shall protect from damage all existing structures, equipment, improvements, utilities and vegetation at or near the Project site; and on adjacent property of a third party, the locations of which are made known to or should be known by Contractor. Contractor shall repair any damage, including that to the property of a third party, resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly, Owner may have the necessary work performed and charge the cost to Contractor.
- B. **Tree and Vegetation Protection.** Contractor shall only remove trees when specifically authorized to do so and shall protect vegetation that will remain in place.

5.12 LAYOUT OF WORK

- A. **Advanced Planning of The Work.** Contractor shall plan and lay out the Work in advance of operations so as to coordinate all work without delay or revision.
- B. **Layout Responsibilities.** Contractor shall lay out the Work from Owner-established baselines and benchmarks indicated on the Drawings and shall be responsible for all field measurements in connection with the layout. Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials and labor required to lay out any part of the Work. Contractor shall be responsible for executing the Work to the lines and grades that may be

established. Contractor shall be responsible for maintaining or restoring all stakes and other marks established.

5.13 MATERIAL AND EQUIPMENT

- A. **Contractor to Provide New and Equivalent Equipment and Materials.** All equipment, material and articles incorporated into the Work shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in the Contract Documents. References in the Specifications to equipment, material, articles or patented processes by trade name, make or catalog number, shall be regarded as establishing a standard quality and shall not be construed as limiting competition. Contractor may, at its option, use any equipment, material, article or process that, in the judgment of A/E, is equal to that named in the specifications, unless otherwise specifically provided in the Contract Documents.
- B. **Contractor Responsible for Fitting Parts Together.** Contractor shall do all cutting, fitting or patching that may be required to make its several parts fit together properly or receive or be received by work of others set forth in, or reasonably implied by, the Contract Documents. Contractor shall not endanger any work by cutting, excavating or otherwise altering the Work and shall not cut or alter the work of any other contractor unless approved in advance by Owner.
- C. **Owner May Reject Defective Work.** Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, the Work, in whatever stage of completion, may be rejected by Owner.

5.14 AVAILABILITY AND USE OF PREMISES AND UTILITY SERVICES

- A. **Use of Premises.** Contractor's use of Owner's premises is limited to Project activities within the areas identified.
- B. **Owner's Occupation of Site.** The Owner may occupy the site and existing building(s) during the entire work period. Contractor agrees to cooperate with Owner during operation to minimize conflicts and facilitate Owner usage. Contractor agrees to perform the work so as not to interfere with the Owner's operations.
- C. **Contractor Must Allow Owner Access.** Contractor must at all times provide for and allow Owner access. Contractor shall not store or stage

vehicles or materials on driveways or at entrances and must keep these access points serving the premises clear and available to the Owner at all times.

- D. **Owner to Provide and Charge for Utilities.** Owner shall make all reasonable utilities available to Contractor from existing outlets and supplies, as specified in the Contract Documents. Unless otherwise provided in the Contract Documents, the utility service consumed shall be charged to or paid for by Contractor at prevailing rates charged to Owner or, where the utility is produced by Owner, at reasonable rates determined by Owner. Contractor will carefully conserve any utilities furnished.
- E. **Contractor to Install Temporary Connections and Meters.** Contractor shall, at its expense and in a skillful manner satisfactory to Owner, install and maintain all necessary temporary connections and distribution lines, together with appropriate protective devices, and all meters required to measure the amount of each utility used for the purpose of determining charges. Prior to the date of Final Acceptance, Contractor shall remove all temporary connections, distribution lines, meters and associated equipment and materials.

5.15 TESTS AND INSPECTION

- A. **Owner to Provide for All Testing and Inspection of Work.** Owner shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Owner shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. Contractor shall give Owner timely notice of when and where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.
- B. **Owner May Conduct Tests and Inspections.** Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals

that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:

1. Constitute or imply acceptance;
2. Relieve Contractor of responsibility for providing adequate quality control measures;
3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials or equipment;
4. Relieve Contractor of its responsibility to comply with the requirements of the Contract Documents; or
5. Impair Owner's right to reject defective or nonconforming items, or to avail itself of any other remedy to which it may be entitled.

C. **Inspections or Inspectors Do Not Modify Contract Documents.** Neither observations by an inspector retained by Owner, the presence or absence of such inspector on the site, nor inspections, tests or approvals by others, shall relieve Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.

D. **Contractor Responsibilities on Inspections.** Contractor shall promptly furnish, without additional charge, all facilities, labor, material and equipment reasonably needed for performing such safe and convenient inspections and tests as may be required by Owner. Owner may charge Contractor any additional cost of inspection or testing when Work is not ready at the time specified by Contractor for inspection or testing, or when prior rejection makes reinspection or retest necessary. Owner shall perform its inspections and tests in a manner that will cause no undue delay in the Work.

5.16 CORRECTION OF NONCONFORMING WORK

A. **Work Covered by Contractor Without Inspection.** If a portion of the Work is covered contrary to the requirements in the Contract Documents, it must, if required in writing by Owner, be uncovered for Owner's observation and be replaced at the Contractor's expense and without change in the Contract Time.

B. **Payment Provisions for Uncovering Covered Work.** If, at any time prior to Final Completion,

Owner desires to examine the Work, or any portion of it, which has been covered, Owner may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an adjustment in the Contract Sum for the costs of uncovering and replacement, and, if completion of the Work is thereby delayed, an adjustment in the Contract Time, provided it makes such a request as provided in Part 7. If such Work is not in accordance with the Contract Documents, the Contractor shall pay the costs of examination and reconstruction.

C. **Contractor to Correct and Pay for Non-Conforming Work.** Contractor shall promptly correct Work found by Owner not to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. Contractor shall bear all costs of correcting such nonconforming Work, including additional testing and inspections.

D. **Contractor's Compliance with Warranty Provisions.** If, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof, or within one (1) year after the date for commencement of any system warranties established under Sections 5.16D, 5.21, 6.08B, or within the 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, Contractor shall correct it promptly after receipt of written notice from Owner to do so. Owner shall give such notice promptly after discovery of the condition. This period of one (1) year 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 performance of the Work. Contractor's duty to correct with respect to Work repaired or replaced shall run for one (1) year from the date of repair or replacement. Obligations under this Section shall survive Final Acceptance.

E. **Contractor to Remove Non-Conforming Work.** Contractor shall remove from the Project site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner.

F. **Owner May Charge Contractor for Non-Conforming Work.** If Contractor fails to correct nonconforming Work within a reasonable time

after written notice to do so, Owner may replace, correct or remove the nonconforming Work and charge the cost thereof to the Contractor.

- G. **Contractor to Pay for Damaged Work During Correction.** Contractor shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, caused by Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

- H. **No Period of Limitation on Other Requirements.** Nothing contained in this Section shall be construed to establish a period of limitation with respect to other obligations which Contractor might have according to the Contract Documents. Establishment of the time period of one (1) year as described in Section 5.16D relates only to the specific obligation of Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, including the time within which such proceedings may be commenced.

- I. **Owner May Accept Non-Conforming Work and Charge Contractor.** If Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Owner may do so instead of requiring its removal and correction, in which case the Contract Sum may be reduced as appropriate and equitable.

5.17 CLEAN UP

- A. **Contractor to Keep Site Clean and Leave It Clean.** Contractor shall at all times keep the Project site, including hauling routes, infrastructures, utilities and storage areas, free from accumulations of waste materials. Before completing the Work, Contractor shall remove from the premises its rubbish, tools, scaffolding, equipment and materials. Upon completing the Work, Contractor shall leave the Project site in a clean, neat and orderly condition satisfactory to Owner. If Contractor fails to clean up as provided herein, and after reasonable notice from Owner, Owner may do so, and the cost thereof shall be charged to Contractor. Contractor further agrees:

1. To comply with regulations of authorities having jurisdiction and safety standards for cleaning;
2. To not burn waste materials;
3. To not bury debris or excess materials on the Owner's property;

4. To not discharge volatile, harmful or dangerous materials into drainage systems; and

5. To remove waste materials from the site and dispose of in a lawful manner.

6. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

5.18 ACCESS TO WORK AND COMMUNICATIONS REGARDING PROJECT STATUS

- A. **Owner and A/E Access to Work Site.** Contractor shall provide Owner and, if applicable, A/E, access to the Work in progress wherever located.

- B. **Pre-Project Conference.** Owner shall conduct a pre-project conference after execution of the Contract and prior to commencement of Contractor's performance. The parties to the Agreement shall review their respective responsibilities and personnel assignments.

1. **Attendees.** The Owner, the Contractor and its superintendent, subcontractors, suppliers, manufacturers and other concerned parties shall be represented by persons authorized to conclude matters relating to the Work.

2. **Agenda.** Discuss significant items that could affect progress, including the tentative project progress schedule, critical sequencing, use of the premises and procedures for processing Change Orders and equipment deliveries.

3. Minutes of the meeting shall be taken by the Owner. The Owner shall promptly distribute the meeting minutes to everyone concerned. Contractor is required to distribute the meeting minutes to affected subcontractors and prime suppliers.

- C. **Progress Meetings at Regular Intervals.** Contractor should attempt to coordinate meeting dates with preparation of payment requests.

1. **Agenda.** Review minutes of the previous progress meeting. Review significant items that could affect progress. Include topics appropriate to the current status of the Project.

2. **Review Project Progress Schedule Since the Last Meeting.** Determine where each activity is in relation to the schedule, and whether on time, ahead of, or behind the schedule. Determine how areas that are behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether revisions are required to ensure that current and subsequent activities will be completed within the Contract time.
- D. **Reporting.** No later than three (3) Days after each meeting, distribute copies of minutes of the meeting to each party present and to parties who should have been present. Include a summary, in narrative form, of progress since the previous meeting.

5.19 OTHER CONTRACTS

Owner may undertake or award other contracts for additional work at or near the Project site. Contractor shall reasonably cooperate with the other contractors and with Owner's employees and shall carefully adapt scheduling and perform the Work in accordance with these Contract Documents to reasonably accommodate the other work.

5.20 SUBCONTRACTORS AND SUPPLIERS

- A. **Subcontractor Responsibilities.** The Contractor shall include the language of this Section in each of its first-tier Subcontracts and shall require each of its Subcontractors to include the same language of this Section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the Subcontractor meets the subcontractor responsibility criteria below. The requirements of this Section apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first-tier subcontracts meet the following bidder responsibility criteria:
 1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
 2. Have a current Washington Unified Business Identifier (UBI) number;
 3. Have a Washington Employment Security Department number, as required in Title 50 RCW;
 4. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
 5. Maintain Industrial Insurance (workers' compensation coverage) for the subcontractor's employees working in Washington, as required in Title 51 RCW;
 6. Have received training on the requirements related to public works and prevailing wage under this chapter and chapter 39.12 RCW. The training must be provided by L&I or by a training provider whose curriculum is approved by L&I. Contractors that have completed three (3) or more public works projects, have had a valid business license in Washington for three (3) or more years, and are listed on the L&I exemption list are exempt from this training requirement;
 7. Within the three (3) year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by L&I, or through a civil judgment entered by a court of limited or general jurisdiction, to have willfully violated, as defined in RCW [49.48.082](#), any provision of chapter [49.46](#), 49.48, or [49.52](#) RCW;
 8. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3); and
 9. If applicable, have:
 - a. An electrical contractor license, if required by Chapter 19.28 RCW; and/or
 - b. An elevator contractor license, if required by Chapter 19.28, RCW.
- B. **Provide Names of Subcontractors and Use Qualified Firms.** Before submitting the first Application for Payment, Contractor shall furnish in writing to Owner the names, addresses and telephone numbers of all Subcontractors, as well as suppliers providing materials in excess of \$2,500 (two thousand five-hundred dollars). Contractor shall utilize Subcontractors and suppliers which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom the Owner has a reasonable objection and shall obtain Owner's written consent before making any substitutions or additions.

- C. **Subcontracts in Writing and Pass Through Provision.** All Subcontracts must be in writing. By appropriate written agreement, Contractor shall require each Subcontractor, so far as applicable to the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor assumes toward Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this Section shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.
- D. **Coordination of Subcontractors; Contractor Responsible for Work.** Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.
- E. **Automatic Assignment of Subcontracts.** Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:
1. **Effective Only After Termination and Owner Approval.** The assignment is effective only after termination by Owner for cause pursuant to Section 9.01 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and
 2. **Owner Assumes Contractor's Responsibilities.** After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.
 3. **Impact of Bond.** The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

5.21 WARRANTY OF CONSTRUCTION

- A. **Contractor Warranty of Work.** In addition to any special warranties provided elsewhere in the Contract Documents, Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed by Contractor.
- B. **Contractor Responsibilities.** With respect to all warranties, express or implied, for Work performed or materials furnished according to the Contract Documents, Contractor shall:
1. **Obtain Warranties.** Obtain all warranties that would be given in normal commercial practice;
 2. **Warranties for Benefit of Owner.** Require all warranties to be executed, in writing, for the benefit of Owner;
 3. **Enforcement of Warranties.** Enforce all warranties for the benefit of Owner, if directed by Owner; and
 4. **Contractor Responsibility for Subcontractor Warranties.** Be responsible to enforce any subcontractor's, manufacturer's, or supplier's warranties should they extend beyond the period specified in the Contract Documents.
- C. **Warranties Beyond Final Acceptance.** The obligations under this Section shall survive Final Acceptance.

5.22 INDEMNIFICATION

- A. In performing work and services hereunder, the Contractor, its employees, agents and representatives, shall be acting as independent contractors, and shall not be deemed or construed to be employees or agents of STA in any manner whatsoever. The Contractor shall not hold itself out as, nor claim to be, an officer or employee of STA by reason hereof, and will not make any claim, demand or application to or for any right or privilege applicable to an officer or employee of STA. The Contractor shall be solely responsible for any claims for wages or compensation by the Contractor's employees, agents and representatives, and shall save and hold STA harmless therefrom.
- B. To the maximum extent permitted by law, the Contractor shall indemnify and hold harmless STA and all of STA's officers, employees, and agents from and against all claims, demands,

suits, penalties and liability of any kind, including injuries to persons or damages to property, which arise out of or are due to any acts, errors, or omissions of the Contractor, or the Contractor's employees, agents, and representatives in performing work and services under this Agreement. In the event that any claims, investigations, demands, suits, actions, and lawsuits arise out of any of the aforesaid acts, errors, or omissions, the Contractor shall assume all costs of defending such claims, suits, actions, or lawsuits, including legal fees incurred by STA, any penalties imposed on STA or the Contractor, and all judgments that may be obtained against STA, or any of its officers, agents, or employees in such suits. Further, the Contractor waives immunity under the Industrial Insurance Act and assumes all liability for actions brought by him or his employees against STA for injuries in the performance of this Agreement. The Contractor represents this provision has been negotiated with STA.

- C. To the maximum extent permitted by law, STA shall indemnify and hold harmless the Contractor and all of Contractor's officers, employees, and agents from and against all claims, demands, suits, penalties and liability of any kind, including injuries to persons or damages to property, which arise out of or are due to any acts, errors, or omissions of STA, or STA's employees, agents, and representatives while engaged in the business of public transportation and with respect to its duties and obligations as fee owner of the real property which Contractor has been engaged to manage. In the event that any claims, investigations, demands, suits, actions, and lawsuits arise out of any of the aforesaid acts, errors, or omissions, STA shall assume all costs of defending such claims, suits, actions, or lawsuits, including legal fees incurred by Contractor, any penalties imposed on Contractor or STA, and all judgments that may be obtained against Contractor, or any of its officers, agents, or employees in such suits. STA represents this provision has been negotiated with Contractor.

PART 6: PAYMENTS AND COMPLETION

6.01 CONTRACT SUM

- A. **Owner Shall Pay Contract Sum.** Owner shall pay Contractor the Contract Sum plus state sales tax for performance of the Work, in accordance with the Contract Documents.

6.02 SCHEDULE OF VALUES

- A. **Contractor to Submit Schedule of Values.** Before submitting its first Application for Payment, Contractor shall submit to Owner for approval a Schedule of Values. The Schedule of Values shall include appropriate amounts for mobilization and demobilization, record drawings, Operations & Maintenance manuals, and any other requirements for Project closeout, and shall be approved and used by Owner as the basis for progress payments. Project closeout costs should be scheduled independent of any retainage amount. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

6.03 APPLICATION FOR PAYMENT

- A. **Statement of Intent to Pay Prevailing Wages.** The Statement of Intent to Pay Prevailing Wages for the Contractor and each Subcontractor must be on file with the Owner before commencement of work and before the first payment can be made.
- B. **Monthly Application for Payment with Substantiation.** At monthly intervals, unless determined otherwise by Owner, Contractor shall submit to Owner an itemized Application for Payment for Work completed in accordance with the Contract Documents and the approved Schedule of Values.
1. Each Application for Payment must include a statement that prevailing wages have been paid by the contractor in accordance with the pre-filed statement or statements of Intent to Pay prevailing wages on file.
 2. If federally funded, certified weekly payrolls must be submitted with Application for Payment.
 3. Each Application for Payment shall be consistent with previous applications and payments as certified and paid for by the Owner.
 4. **Payment Application Times.** Progress payments will be made only for actual work performed or materials delivered.
 5. **Payment Application Forms.** Use the Form for Applications for Payment included in the addenda or preapproved format.
 6. Include amounts of Change Orders and Construction Change Directives issued prior to the last Day of the construction period covered by the application.

7. **Transmittal.** Submit one (1) executed copy of each Application for Payment to the Owner by means ensuring receipt within twenty-four (24) hours; one (1) copy shall be complete, including waivers of lien and similar attachments, when required.
 8. Transmit each copy with a transmittal form listing attachment(s), and recording appropriate information related to the application in a manner acceptable to the Owner.
 9. **Waivers of Mechanics Lien.** With each Application for Payment, submit waivers of lien from every entity who may lawfully be entitled to file a lien arising out of the Contract, and related to the work covered by the payment.
 10. The Contractor shall be paid, upon the submission of proper applications for payment, within thirty (30) Days after STA's approval of the Contractor's application.
- C. **Contractor Certifies Subcontractors Paid.** By submitting an Application for Payment, Contractor is certifying that all Subcontractors have been paid, less earned retainage in accordance with RCW 60.28.011, as their interests appeared in the last preceding certificate of payment. By submitting an Application for Payment, Contractor is recertifying that the representations set forth in Section 1.03 are true and correct, to the best of Contractor's knowledge, as of the date of the Application for Payment.
- D. **Reconciliation of Work with Progress Schedule.** At the time it submits an Application for Payment, Contractor shall analyze and reconcile, to the satisfaction of Owner, the actual progress of the Work with the Progress Schedule.
- E. **Payment for Material Delivered to Site or Stored Off-Site.** If authorized by Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested for material stored off the Project site, provided Contractor complies with or furnishes satisfactory evidence of the following:
1. **Suitable Facility or Location.** The material will be placed in a facility or location that is structurally sound, dry, lighted and suitable for the materials to be stored;
 2. **Facility or Location Within 10 Miles of Project.** The facility or location is located within a ten (10) mile radius of the Project. Other locations may be utilized, if approved in writing, by Owner;
 3. **Facility or Location Exclusive to Project's Materials.** Only materials for the Project are stored within the facility or location (or a secure portion of a facility or location set aside for the Project);
 4. **Insurance Provided on Materials in Facility or Location.** Contractor furnishes Owner a certificate of insurance extending Contractor's insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;
 5. **Facility or Location Locked and Secure.** The facility or location (or secure portion thereof) is continuously under lock and key, and only Contractor's authorized personnel shall have access;
 6. **Owner Right of Access to Facility or Location.** Owner shall at all times have the right of access in company of Contractor;
 7. **Contractor Assumes Total Responsibility for Stored Materials.** Contractor and its surety assume total responsibility for the stored materials; and
 8. **Contractor Provides Documentation and Notice When Materials Moved to Site.** Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be required, and shall also furnish Notice to Owner when materials are moved from storage to the Project site.
- 6.04 PROGRESS PAYMENTS
- A. **Owner to Pay Within Thirty (30) Days.** Owner shall make progress payments, in such amounts as Owner determines are properly due, within thirty (30) Days after receipt of a properly executed and complete Application for Payment. Owner shall notify Contractor in accordance with chapter 39.76 RCW if the Application for Payment does not comply with the requirements of the Contract Documents.
- B. **Withholding Retainage; Options for Retainage.** When allowed by law, Owner shall retain five percent (5%) of the amount of each progress payment until forty-five (45) Days after Final Acceptance and receipt of all documents

required by law or the Contract Documents, including, at Owner's request, consent of surety to release of the retainage. In accordance with chapter 60.28 RCW, Contractor may request that monies reserved be retained in a fund by Owner, deposited by Owner in a bank or savings and loan, or placed in escrow with a bank or trust company to be converted into bonds and securities to be held in escrow with interest to be paid to Contractor. Owner may permit Contractor to provide an appropriate bond in lieu of the retained funds.

1. When the Project is subject to Federal Assistance, the Owner shall rely upon the Contractor's Payment and Performance Bonds to satisfy (i) The claims of any person or persons arising under the contract to the extent such claims are provided for in RCW [39.08.010](#); and (ii) the state with respect to taxes, increases, and penalties incurred on the public improvement project under Titles [50](#), [51](#), and [82](#) RCW which may be due. The contract bond must remain in full force and effect until, at a minimum, all claims filed in compliance with chapter [39.08](#) RCW are resolved.

C. **Title Passes to Owner Upon Payment.** Title to all Work and materials covered by a progress payment shall pass to Owner at the time of such payment free and clear of all liens, claims, security interests, and encumbrances. Passage of title shall not, however, relieve Contractor from any of its duties and responsibilities for the Work or materials, or waive any rights of Owner to insist on full compliance by Contractor with the Contract Documents.

D. **Interest on Unpaid Balances.** Payments due and unpaid in accordance with the Contract Documents may bear interest as specified in Chapter 39.76 RCW.

6.05 PAYMENTS WITHHELD

A. **Owner's Right to Withhold Payment.** Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:

1. **Non-Compliant Work.** Work not in accordance with the Contract Documents;
2. **Remaining Work to Cost More Than Unpaid Balance.** Reasonable evidence that

the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;

3. **Owner Correction or Completion Work.** Work by Owner to correct defective Work or complete the Work in accordance with Section 5.16;
4. **Contractor's Failure to Perform.** Contractor's failure to perform in accordance with the Contract Documents; or
5. **Contractor's Negligent Acts or Omissions.** Cost or liability that may occur to Owner as the result of Contractor's fault or negligent acts or omissions.

B. **Owner to Notify Contractor of Withholding for Unsatisfactory Performance.** In any case where part or all of a payment is going to be withheld for unsatisfactory performance, Owner shall notify Contractor in accordance with Chapter 39.76 RCW.

6.06 RETAINAGE AND BOND CLAIM RIGHTS

A. **Chapters 39.08 RCW and 60.28 RCW Incorporated by Reference.** Chapters 39.08 and 60.28 RCW, concerning the rights and responsibilities of Contractor and Owner with regard to the performance and payment bonds and retainage, are made a part of the Contract Documents by reference as though fully set forth herein.

6.07 SUBSTANTIAL COMPLETION

A. **Substantial Completion Defined.** Substantial Completion is the stage in the progress of the Work (or portion thereof designated and approved by Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and unrestricted use and benefit of the facilities (or portion thereof designated and approved by Owner) for the use for which it is intended. All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required occupancy permits have not been issued, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. The date Substantial Completion is achieved shall be established in writing by Owner. Contractor may request an early date of

Substantial Completion which must be approved by Change Order. Owner's occupancy of the Work or designated portion thereof does not necessarily indicate that Substantial Completion has been achieved.

6.08 PRIOR OCCUPANCY

- A. **Prior Occupancy Defined; Restrictions.** Owner may, upon written notice thereof to Contractor, take possession of or use any completed or partially completed portion of the Work ("Prior Occupancy") at any time prior to Substantial Completion. Unless otherwise agreed in writing, Prior Occupancy shall not: be deemed an acceptance of any portion of the Work; accelerate the time for any payment to Contractor; prejudice any rights of Owner provided by any insurance, bond, guaranty, or the Contract Documents; relieve Contractor of the risk of loss or any of the obligations established by the Contract Documents; establish a date for termination or partial termination of the assessment of liquidated damages; or constitute a waiver of claims.
- B. **Damage; Duty to Repair and Warranties.** Notwithstanding anything in the preceding Section, Owner shall be responsible for loss of or damage to the Work resulting from Prior Occupancy. Contractor's one (1) year duty to repair any system warranties shall begin on building systems activated and used by Owner as agreed in writing by Owner and Contractor.

6.09 FINAL INSPECTION, FINAL COMPLETION, ACCEPTANCE, AND PAYMENT (PROJECT CLOSE-OUT)

- A. **Final Inspection.** On receipt of a request for inspection, the Owner will either proceed with inspection or advise the Contractor of unfilled requirements. The Owner will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
- B. The Owner will repeat the inspection once when requested and assured that the work has been substantially completed. Subsequent inspections necessary to assure that the work has been substantially completed will be charged at the Owner representative's normal billing rate and a Construction Change Directive will be prepared to deduct the representative's charges from the Contract Sum.

1. The Owner will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Owner.
 2. Upon completion of reinspection, the Owner will prepare a certificate of Final Acceptance, or advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for Final Acceptance.
- C. Before requesting final inspection for certification of Final Acceptance and final payment, Contractor must complete the following:
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 2. Submit an updated final statement, accounting for final additional changes, if applicable, to the Contract Sum.
 3. Submit a certified copy of the Owner's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and the list has been endorsed and dated by the Owner.
 4. Submit a consent of surety to final payment.
 5. Submit a final liquidated damages settlement statement, if applicable.
 6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 7. Closeout and final payment of this project may be contingent upon completion and resolution of a Davis-Bacon Prevailing Wage audit.
 8. Remove temporary protection and facilities installed for protection of the work during construction.
 9. Assurance that unsettled claims will be settled.
 10. Assurance that work not complete and accepted will be completed without undue delay.
 11. Transmittal of required project construction records to Owner.

12. Proof that taxes, fees, and similar obligations have been paid.
 13. Removal of surplus materials (not belonging to STA), rubbish and similar elements.
 14. Affidavit of Wages Paid certification.
 15. If federally funded, submit final certified weekly payrolls.
 16. All required warranties have been written and submitted.
- D. **Final Completion Defined.** Final Completion shall be achieved when the Work is fully and finally complete in accordance with the Contract Documents. The date Final Completion is achieved shall be established by Owner in writing, but in no case shall constitute Final Acceptance which is a subsequent, separate, and distinct action.
- E. **Final Acceptance Defined.** Final Acceptance shall be achieved when the Contractor has completed the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Prior to Final Acceptance, Contractor shall, in addition to all other requirements in the Contract Documents, submit to Owner a written notice of any outstanding disputes or claims between Contractor and any of its Subcontractors, including the amounts and other details thereof. Neither Final Acceptance, nor final payment, shall release Contractor or its sureties from any obligations of these Contract Documents or the payment and performance, or constitute a waiver of any claims by Owner arising from Contractor's failure to perform the Work in accordance with the Contract Documents.
1. Final payment (retainage or release of bond where applicable) cannot be made until Release of Lien Notices have been received from the Washington State Department of Revenue, Employment Security Department, and L&I, if applicable.
- F. **Final Payment Waives Claim Rights.** Acceptance of final payment by Contractor, or any Subcontractor, shall constitute a waiver and release to Owner of all claims by Contractor, or any such Subcontractor, for an increase in the Contract Sum or the Contract Time, and for every act or omission of Owner relating to or arising out of the Work, except for those Claims made in accordance with the procedures, including the time limits identified in the Contract Documents.
- G. **Prior to and/or contemporaneous with, Final Acceptance the following must be complete:**
1. Contractor must submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents;
 2. Contractor must obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates, and similar releases as applicable;
 3. Contractor must complete final clean up requirements; and
 4. Contractor must arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives.

PART 7: CHANGES

7.01 CHANGE IN THE WORK

- A. **Changes in Work, Contract Sum, And Contract Time by Change Order.** Owner may, at any time and without notice to Contractor's surety, order additions, deletions, revisions, or other changes in the Work. These changes in the Work shall be incorporated into the Contract Documents through the execution of Change Orders. If any change in the Work ordered by Owner causes an increase or decrease in the Contract Sum or the Contract Time, an equitable adjustment shall be made as provided in Section 7.02 or 7.03, respectively, and such adjustment(s) shall be incorporated into a Change Order.
- B. **Owner May Request COP from Contractor.** If Owner desires to order a change in the Work, it may request a written Change Order Proposal (COP) from Contractor. Contractor shall submit a Change Order Proposal within fourteen (14) Days of the request from Owner, or within such other period as mutually agreed. Contractor's Change Order Proposal shall be full compensation for implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of

efficiency or productivity occasioned by the change in the Work.

C. **COP Negotiations.** Upon receipt of the Change Order Proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, or both, as provided in Sections 7.02 and 7.03, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with Contractor. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner's approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.

D. **Change Order as Full Payment and Final Settlement.** If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.

E. **Failure to Agree Upon Terms of Change Order; Final Offer and Claims.** If Owner and Contractor are unable to reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, Contractor may at any time in writing, request a final offer from Owner. Owner shall provide Contractor with its written response within thirty (30) Days of Contractor's request. Owner may also provide Contractor with a final offer at any time. If Contractor rejects Owner's final offer, or the parties are otherwise unable to reach agreement, Contractor's only remedy shall be to file a Claim as provided in Part 8.

F. **Field Authorizations.** The Owner may direct the Contractor to proceed with a change in the Work through a written "Field Authorization" (also referred to as a "Field Order") when the time required to price and execute a Change Order would impact the Project.

The Field Authorization shall describe and include the following:

1. The Scope of change to the Work;
2. An estimated amount to perform the scope of the change to the Work;
3. Any estimated change to the Contract Time; and
4. The method of final cost determination in accordance with the requirements of Section 7.02A.3 of the GC; and

Upon satisfactory submittal by the Contractor and approval by the Owner of supporting cost data a Change Order will be executed. The Owner will not make payment to the Contractor for Field Authorization Work until that work has been incorporated into an executed Change Order.

7.02 CHANGE IN THE CONTRACT SUM

A. General Application

1. **Contract Sum Changes Only by Change Order.** The Contract Sum shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Sum in its Change Order Proposal.
2. **Owner Fault or Negligence as Basis for Change in Contract Sum.** If the cost of Contractor's performance is changed due to the fault or negligence of Owner, or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Sum in accordance with the following procedure. No change in the Contract Sum shall be allowed to the extent: Contractor's changed cost of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible; the change is concurrently caused by Contractor and Owner; or the change is caused by an act of Force Majeure as defined in Section 3.05A.
 - a. **Notice and Record Keeping for Equitable Adjustment.** A request for an equitable adjustment in the Contract Sum shall be based on written notice delivered to Owner within seven (7) Days of the occurrence of the event giving rise to the request. For purposes of this part, "occurrence" means when Contractor knew, or in its diligent prosecution of the Work should have known, of the event giving rise to the request. If Contractor believes it is entitled to an adjustment in the Contract

Sum, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such records and, if requested shall promptly furnish copies of such records to Owner.

b. **Content of Notice for Equitable Adjustment; Failure to Comply.**

Contractor shall not be entitled to any adjustment in the Contract Sum for any occurrence of events or costs that occurred more than seven (7) Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Sum; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Sum requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

- c. **Contractor to Provide Supplemental Information.** Within thirty (30) Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with Section 7.02A.2.a above with additional supporting data. Such additional data shall include, at a minimum: the amount of compensation requested, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the damages claimed, but that the damages claimed were actually a result of the act, event, or condition complained of and that the Contract Documents provide entitlement to an equitable adjustment to Contractor for such act, event, or condition; and documentation sufficiently detailed to permit an informed analysis of the request by Owner. When the request for compensation relates to a delay, or other change in Contract Time, Contractor shall demonstrate the impact on the

critical path, in accordance with Section 7.03C. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are-prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

d. **Contractor to Proceed with Work as Directed.**

Pending final resolution of any request made in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.

e. **Contractor to Combine Requests for Same Event Together.**

Any requests by Contractor for an equitable adjustment in the Contract Sum and in the Contract Time that arise out of the same event(s) shall be submitted together.

3. **Methods for Calculating Change Order Amount.**

The value of any Work covered by a Change Order, or of any request for an equitable adjustment in the Contract Sum, shall be determined by one of the following methods:

- a. **Fixed Price.** On the basis of a fixed price as determined in Section 7.02B.

- b. **Unit Prices.** By application of unit prices to the quantities of the items involved as determined in Section 7.02C.

- c. **Time and Materials.** On the basis of time and material as determined in Section 7.02D.

- d. **Fixed Price Method Is Default; Owner May Direct Otherwise.** When Owner has requested Contractor to submit a Change Order Proposal, Owner may direct Contractor as to which method in Section 7.02A.3 to use when submitting its proposal. Otherwise, Contractor shall determine the value of the Work, or of a request for an equitable adjustment, on the basis of the fixed price method.

B. **Change Order Pricing -- Fixed Price**

Procedures. When the fixed price method is used to determine the value of any Work covered by a Change Order, or of a request for an equitable adjustment in the Contract Sum, the following procedures shall apply:

1. **Breakdown and Itemization of Details on COP.** Contractor's Change Order Proposal, or request for adjustment in the Contract Sum, shall be accompanied by a complete itemization of the costs, including labor, material, subcontractor costs, and overhead and profit. The costs shall be itemized in the manner set forth below and shall be submitted on breakdown sheets in a form approved by Owner.
2. **Use of Industry Standards in Calculating Costs.** All costs shall be calculated based upon appropriate industry standard methods of calculating labor, material quantities, and equipment costs.
3. **Costs Contingent on Owner's Actions.** If any of the Contractor's pricing assumptions are contingent upon anticipated actions of Owner, Contractor shall clearly state them in the proposal or request for an equitable adjustment.
4. **Markups on Additive and Deductive Work.** The cost of any additive or deductive changes in the Work shall be calculated as set forth below, except that overhead and profit shall not be included on deductive changes in the Work. Where a change in the Work involves additive and deductive work by the same Contractor or Subcontractor, small tools, overhead, profit, bond and insurance markups will apply to the net difference.
5. **Breakdown Not Required If Change Less Than \$1,000.** If the total cost of the change in the Work or request for equitable adjustment does not exceed \$1,000, Contractor shall not be required to submit a breakdown if the description of the change in the Work or request for equitable adjustment is sufficiently definitive for Owner to determine fair value.
6. **Breakdown Required If Change Between \$1,000 And \$2,500.** If the total cost of the change in the Work or request for equitable adjustment is between \$1,000 and \$2,500, Contractor may submit a breakdown in the following level of detail if the description of the change in the Work or if the request for equitable adjustment is sufficiently definitive to permit the Owner to determine fair value:
 - a. lump sum labor;
 - b. lump sum material;
 - c. lump sum equipment usage;
 - d. overhead in accordance with Section 7.02B.7.f;
 - e. profit in accordance with Section 7.02B.7.g; and
 - f. insurance and bond costs in accordance with Section 7.02B.7.h.
7. **Components of Increased Cost.** Any request for adjustment of Contract Sum based upon the fixed price method over \$2,500 shall include only the following items:
 - a. **Craft Labor Costs.** These are the labor costs determined by multiplying the estimated or actual additional number of craft hours needed to perform the change in the Work by the hourly labor costs. Craft hours should cover direct labor, as well as indirect labor due to trade inefficiencies. The hourly costs shall be based on the following:
 - (1) **Basic Wages and Benefits.** Hourly rates and benefits as stated on the L&I approved Intent or Davis-Bacon prevailing wages, or a higher amount if approved by the Owner. Direct supervision shall be a reasonable percentage not to exceed fifteen percent (15%) of the cost of direct labor. No supervision markup shall be allowed for a working supervisor's hours.
 - (2) **Worker's Compensation Insurance.** Direct contributions to the state of Washington for industrial insurance; medical aid; and supplemental pension, by the class and rates established by L&I.
 - (3) **Federal Insurance.** Direct contributions required by the Federal Insurance Compensation Act; Federal Unemployment Tax Act; and the State Unemployment Compensation Act.
 - (4) **Travel Allowance.** Travel allowance and/or subsistence, if applicable, shall be consistent with Owner's policy allowing reimbursement or allotment of amounts actual, reasonable, and necessary. Owner's full policy regarding Travel is available on request.

- (5) **Safety.** Cost incurred due to the Washington Industrial Safety and Health Act, which shall be a reasonable percentage not to exceed two percent (2%) of the sum of the amounts calculated in (1), (2), and (3) above.
- b. **Material Costs.** This is an itemization of the quantity and cost of materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs, second from supplier quotations or if these are not available, from standard industry pricing guides. Material costs shall consider all available discounts. Freight costs, express charges, or special delivery charges shall be itemized.
- c. **Equipment Costs.** This is an itemization of the type of equipment and the estimated or actual length of time the construction equipment appropriate for the Work is or will be used on the change in the Work. Costs will be allowed for construction equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. Equipment charges shall be computed on the basis of actual invoice costs or if owned, from the current edition of one of the following sources:
- (1) Associated General Contractors - Washington State Department of Transportation ("AGC WSDOT") Equipment Rental Agreement current edition, on the Contract execution date.
 - (2) The state of Washington Utilities and Transportation Commission for trucks used on highways.
 - (3) The National Electrical Contractors Association for equipment used on electrical work.
 - (4) The Mechanical Contractors Association of America for equipment used on mechanical work.
 - (5) The EquipmentWatch Rental Rate (Blue Book) shall be used as a basis for establishing rental rates of equipment not listed in the above sources. The maximum rate for standby equipment shall not exceed that shown in the AGC WSDOT Equipment Rental Agreement, current edition on the Contract execution date.
- d. **Allowance for Small Tools, Expendables & Consumable Supplies.** Small tools consist of tools which cost \$250 or less and are normally furnished by the performing contractor. The maximum rate for small tools shall not exceed the following:
- (1) **3% For Contractor.** For Contractor, three percent (3%) of direct labor costs.
 - (2) **5% For Subcontractors.** For Subcontractors, five percent (5%) of direct labor costs.
- Expendables and consumable supplies directly associated with the change in Work must be itemized.
- e. **Subcontractor Costs.** This is defined as payments Contractor makes to Subcontractors for changed Work performed by Subcontractors of any tier. The Subcontractors' cost of Work shall be calculated and itemized in the same manner as prescribed herein for Contractor.
- f. **Allowance for Overhead.** This is defined as costs of any kind attributable to direct and indirect delay, acceleration, or impact, added to the total cost to Owner of any change in the Contract Sum. If the Contractor is compensated under Section 7.03D, the amount of such compensation shall be reduced by the amount Contractor is otherwise entitled to under this Section. This allowance shall compensate Contractor for all non-craft labor, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, B&O taxes, office engineering, estimating costs, additional overhead because of extended time, and any other cost incidental to the change in the Work. It shall be strictly limited in all cases to a reasonable amount, mutually acceptable, or if none can be agreed upon to an amount not to exceed the rates below:

- (1) **Projects Less Than \$3 Million.** For projects where the Contract Award Amount is under \$3 million, the following shall apply:

- (a) **Contractor Markup on Contractor Work.** For Contractor, for any Work actually performed by Contractor's own forces, shall not exceed sixteen percent (16%) of the first \$50,000 of the cost, and four percent (4%) of the remaining cost, if any.
- (b) **Subcontractor Markup for Subcontractor Work.** For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, shall not exceed sixteen percent (16%) of the first \$50,000 of the cost, and four percent (4%) of the remaining cost, if any.
- (c) **Contractor Markup for Subcontractor Work.** For Contractor, for any work performed by its Subcontractor(s), shall not exceed six percent (6%) of the first \$50,000 of the amount due each Subcontractor, and four percent (4%) of the remaining amount if any.
- (d) **Subcontractor Markup for Lower Tier Subcontractor Work.** For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, shall not exceed four percent (4%) of the first \$50,000 of the amount due the sub-Subcontractor, and two percent (2%) of the remaining amount if any.
- (e) **Basis of Cost Applicable for Markup.** The cost to which overhead is to be applied shall be developed in accordance with Sections 7.02B.7.a through 7.02B.7.e.

- (2) **Projects More Than \$3 Million.** for projects where the Contract

Award Amount is equal to or exceeds \$3 million, the following shall apply:

- (a) **Contractor Markup on Contractor Work.** For Contractor, for any Work actually performed by Contractor's own forces, shall not exceed twelve percent (12%) of the first \$50,000 of the cost, and four percent (4%) of the remaining cost, if any.
- (b) **Subcontractor Markup for Subcontractor Work.** For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, shall not exceed twelve percent (12%) of the first \$50,000 of the cost, and four percent (4%) of the remaining cost, if any.
- (c) **Contractor Markup for Subcontractor Work.** For Contractor, for any Work performed by its Subcontractor(s), shall not exceed four percent (4%) of the first \$50,000 of the amount due each Subcontractor, and two percent (2%) of the remaining amount if any.
- (d) **Subcontractor Markup for Lower Tier Subcontractor Work.** For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, shall not exceed four percent (4%) of the first \$50,000 of the amount due the sub-Subcontractor, and two percent (2%) of the remaining amount if any.
- (e) **Basis of Cost Applicable for Markup.** The cost to which overhead is to be applied shall be developed in accordance with Sections 7.02B.7.a through 7.02B.7.e.
- g. **Allowance for Profit.** This allowance for profit is an amount to be added to the cost of any change in contract sum, but

not to the cost of change in Contract Time for which contractor has been compensated pursuant to the conditions set forth in Section 7.03. It shall be limited to a reasonable amount, mutually acceptable, or if none can be agreed upon, to an amount not to exceed the rates below:

(1) **Contractor/Subcontractor Markup for Self-Performed Work.** For Contractor or Subcontractor of any tier for work performed by their forces, six percent (6%) of the cost developed in accordance with Sections 7.02B.7.a through 7.02B.7.e.

(2) **Contractor/Subcontractor Markup for Work Performed at Lower Tier.** For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, shall not exceed four percent (4%) of the subcontract cost developed in accordance with Sections 7.02B.7.a through 7.02B.7.h.

h. **Insurance and Bond Premiums.** Cost of change in insurance or bond premium. This is defined as:

(1) **Contractor's Liability Insurance.** The cost of any changes in Contractor's liability insurance arising directly from execution of the Change Order; and

(2) **Payment and Performance Bond.** The cost of the additional premium for Contractor's bond arising directly from the changed Work.

The cost of any change in insurance or bond premium shall be added after overhead and allowance for profit are calculated in accordance with Sections 7.02B.7.f and 7.02B.7.g.

C. **Change Order Pricing -- Unit Prices**

1. **Content of Owner authorization.** Whenever Owner authorizes Contractor to perform Work on a unit-price basis, Owner's authorization shall clearly state:

a. **Scope.** Scope of work to be performed;

b. **Reimbursement Basis.** Type of reimbursement including pre-agreed rates for material quantities; and

c. **Reimbursement Limit.** Cost limit of reimbursement.

2. **Contractor Responsibilities.** Contractor shall:

a. Cooperate with owner and assist in monitoring the work being performed. As requested by Owner, Contractor shall identify workers assigned to the Change Order Work and areas in which they are working;

b. Leave access as appropriate for quantity measurement; and

c. Not exceed any cost limit(s) without Owner's prior written approval.

3. **Cost Breakdown Consistent with Fixed Price Requirements.** Contractor shall submit costs in accordance with Section 7.02B and satisfy the following requirements:

a. **Unit Prices Must Include Overhead, Profit, Bond and Insurance Premiums.** Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs; and

b. **Owner Verification of Quantities.** Quantities must be supported by field measurement statements approved by Owner.

D. **Change Order Pricing -- Time-and-Material Prices**

1. **Content of Owner Authorization.** Whenever Owner authorizes Contractor to perform Work on a time-and-material basis, Owner's authorization shall clearly state:

a. **Scope.** Scope of Work to be performed;

b. **Reimbursement Basis.** Type of reimbursement including pre-agreed rates, if any, for material quantities or labor; and

c. **Reimbursement Limit.** Cost limit of reimbursement.

2. **Contractor responsibilities.** Contractor shall:

- a. **Identify Workers Assigned.** Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, identify workers assigned to the Change Order Work and areas in which they are working;
 - b. **Provide Daily Timesheets.** Identify on daily time sheets all labor performed in accordance with this authorization. Submit copies of daily time sheets within two (2) business days for Owner's review;
 - c. **Allow Owner to Measure Quantities.** Leave access as appropriate for quantity measurement;
 - d. **Perform Work Efficiently.** Perform all Work in accordance with this Section as efficiently as possible; and
 - e. **Not Exceed Owner's Cost Limit.** Not exceed any cost limit(s) without Owner's prior written approval.
3. **Cost Breakdown Consistent with Fixed Price Requirements.** Contractor shall submit costs in accordance with Section 7.02B and additional verification supported by:
- a. **Timesheets.** Labor detailed on daily time sheets; and
 - b. **Invoices.** Invoices for material.

7.03 CHANGE IN THE CONTRACT TIME

- A. **COP Requests for Contract Time.** The Contract Time shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Time in its Change Order Proposal.
- B. **Time Extension Permitted If Not Contractor's Fault.** If the time of Contractor's performance is changed due to an act of Force Majeure, or due to the fault or negligence of Owner or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Time in accordance with the following procedure. No adjustment in the Contract Time shall be allowed to the extent Contractor's changed time of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible.
1. **Notice and Record Keeping for Contract Time Request.** A request for an equitable

adjustment in the Contract Time shall be based on written notice delivered within seven (7) Days of the occurrence of the event giving rise to the request. If Contractor believes it is entitled to adjustment of Contract Time, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such record and if requested, shall promptly furnish copies of such record to Owner.

2. **Timing and Content of Contractor's Notice.** Contractor shall not be entitled to an adjustment in the Contract Time for any events that occurred more than seven (7) Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Time; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Time requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
3. **Contractor to Provide Supplemental Information.** Within thirty (30) Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with Section 7.03B.2 with additional supporting data. Such additional data shall include, at a minimum: the amount of delay claimed, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the delay claimed, but that the delay claimed was actually a result of the act, event, or condition complained of, and that the Contract Documents provide entitlement to an equitable adjustment in Contract Time for such act, event, or condition; and supporting documentation sufficiently detailed to permit an informed analysis of the request by Owner. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are

- prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
4. **Contractor to Proceed with Work as Directed.** Pending final resolution of any request in accordance with this Section, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
- C. **Contractor to Demonstrate Impact on Critical Path of Schedule.** Any change in the Contract Time covered by a Change Order, or based on a request for an equitable adjustment in the Contract Time, shall be limited to the change in the critical path of Contractor's schedule attributable to the change of Work or event(s) giving rise to the request for equitable adjustment. Any Change Order Proposal or request for an adjustment in the Contract Time shall demonstrate the impact on the critical path of the schedule. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event: had a specific impact on the critical path, and except in case of concurrent delay, was the sole cause of such impact; and could not have been avoided by resequencing of the Work or other reasonable alternatives.
- D. **Cost of Change in Contract Time.** Contractor may request compensation for the cost of a change in Contract Time in accordance with this Section, 7.03.D, subject to the following conditions:
1. **Must Be Solely Fault of Owner Or A/E.** The change in Contract Time shall solely be caused by the fault or negligence of Owner or A/E;
 2. **Procedures.** Contractor shall follow the procedure set forth in Section 7.03B;
 3. **Demonstrate Impact on Critical Path.** Contractor shall establish the extent of the change in Contract Time in accordance with Section 7.03C; and
 4. **Limitations on Daily Costs.** The daily cost of any change in Contract Time shall be limited to the items below, less the amount of any change in the Contract Sum the Contractor may otherwise be entitled to pursuant to Section 7.02B.7.f for any change in the Work that contributed to this change in Contract Time:
 - a. **Non-Productive Supervision of Labor.** Cost of nonproductive field supervision or labor extended because of the delay;
 - b. **Weekly Meetings and Indirect Activities.** Cost of weekly meetings or similar indirect activities extended because of the delay;
 - c. **Temporary Facilities or Equipment Rental.** Cost of temporary facilities or equipment rental extended because of the delay;
 - d. **Insurance Premiums.** Cost of insurance extended because of the delay;
 - e. **Overhead.** General and administrative overhead in an amount to be agreed upon, but not to exceed three percent (3%) of the Contract Award Amount divided by the originally specified Contract Time for each Day of the delay.
- PART 8: CLAIMS AND DISPUTE RESOLUTION
- 8.01 CLAIMS
- A. **A Claim is Contractor's Remedy.** If the parties fail to reach agreement on the terms of any Change Order for Owner-directed Work as provided in Section 7.01, on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Section 7.02, the Contract Time as provided in Section 7.03, or any dispute interpretation of the parties respective obligations and duties under the Contract documents Contractor's only remedy shall be to file a Claim with Owner as provided in this Section.
- B. **Claim Filing Deadline for Contractor.** Contractor shall file its Claim within one-hundred-twenty (120) Days from Owner's final offer made in accordance with Section 7.01E or by the date of Final Acceptance, whichever occurs first.
- C. **Claim Must Cover All Costs and Be Documented.** The Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor may be entitled. It shall be fully substantiated and documented. At a minimum, the Claim shall contain the following information:
1. **Factual Statement of Claim.** A detailed factual statement of the Claim for additional compensation and time, if any, providing all necessary dates, locations, and items of Work affected by the Claim;

2. **Dates.** The date on which facts arose that gave rise to the claim;
 3. **Owner and A/E Employee's Knowledgeable About Claim.** The name of each employee of Owner or A/E knowledgeable about the Claim;
 4. **Support from Contract Documents.** The specific provisions of the Contract Documents which support the Claim;
 5. **Identification of Other Supporting Information.** The identification of any documents and the substance of any oral communications that support the Claim;
 6. **Copies of Supporting Documentation.** Copies of any identified documents, other than the Contract Documents, that support the Claim;
 7. **Details on Claim for Contract Time.** If an adjustment in the Contract Time is sought: the specific days and dates for which it is sought; the specific reasons Contractor believes an extension in the Contract Time should be granted; and Contractor's analysis of its Progress Schedule to demonstrate the reason for the extension in Contract Time;
 8. **Details on Claim.** for adjustment of Contract Sum: If an adjustment in the Contract Sum is sought, the exact amount sought and a breakdown of that amount into the categories set forth in, and in the detail as required by Section 7.02; and
 9. **Statement Certifying Claim.** A statement certifying, under penalty of perjury, that the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor's knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes Owner is liable.
- D. **Response to Claim Filed.** After Contractor has submitted a fully documented Claim that complies with all applicable provisions of Parts 7 and 8, Owner's Contract Compliance Specialist ("CCS"), or their designee, shall respond, in writing, to Contractor as follows:
1. **Response Time for Claim Less Than \$50,000.** If the Claim amount is less than \$50,000, with a decision within sixty (60) Days from the date the Claim is received; or
 2. **Response Time for Claim Of \$50,000 Or More.** If the Claim amount is \$50,000 or more, with a decision within sixty (60) Days from the date the Claim is received, or with notice to Contractor of the date by which it will render its decision. Owner will then respond with a written decision in such additional time.
- E. **Review of Claim and Finality of Decision.** To assist in the review of Contractor's Claim, Owner's CCS, or their designee, may visit the Project site, or request additional information, in order to fully evaluate the issues raised by the Claim. Contractor shall proceed with performance of the Work pending final resolution of any Claim. Owner's CCS' written decision as set forth above shall be final and conclusive as to all matters set forth in the Claim, unless Contractor follows the procedure set forth in Section 8.02.
- F. **Waiver of Contractor Rights for Failure to Comply with This Section.** Any Claim of the Contractor against the Owner for damages, additional compensation, or additional time, shall be conclusively deemed to have been waived by the Contractor unless made in accordance with the requirements of this Section.
- G. **Finality of Decision.** The CCS' decision shall be final and conclusive unless within ten (10) Days from the date of receipt of its copy, the Contractor mails or otherwise furnishes a written appeal to the Chief Executive Officer ("CEO") of STA. STA's CEO review of the Contracting Officer's decision is limited to a review and decision issued on the same record presented to the Contracting Officer.
- H. **Appeal Procedure.** In connection with appeal to CEO, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its position. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of this Contract while matters in dispute are being resolved. The final decision of the CEO shall be binding upon the Contractor and the Contractor shall abide by the decision. The only available review is by an arbitrator as provided below and the applicable standard of review is whether the CEO's decision was arbitrary and capricious.

8.02 ARBITRATION

- A. **Timing of Contractor's Demand for Review of CEO's Decision by Third-Party Neutral (Arbitration).** If Contractor disagrees with CEO's decision rendered in accordance with Section 8.01H, Contractor shall provide Owner with a written demand for review by a third-party neutral (arbitration). No demand for arbitration of any such Claim shall be made later than thirty (30) Days after the date of the CEO's decision on such Claim. Failure to demand arbitration within said thirty (30) Day period shall result in the CEO's decision being final and binding upon Contractor and its Subcontractors.
- B. **Selection of The Third-Party Neutral (Arbitrator).** The parties shall mutually select a third-party neutral to review the parties' claims within the confines of the decision issued by the CEO. If the parties are unable to mutually select a third-party neutral, they shall each appoint a neutral and the two appointed neutrals shall agree to the appointment of the third-party neutral who will preside over the matter.
- C. **Standard of Review.** The arbitrator's review shall be limited to determining whether the CEO acted arbitrarily and capriciously in issuing its decision. Decisions issued under the Administrative Procedures Act may guide the arbitrator in determining whether the CEO acted arbitrarily and capriciously.
- D. **Costs of Arbitration.** The costs of arbitration will be borne by the party against whom judgment is issued. To the extent neither party substantially prevails at arbitration, the parties will split equally the costs associated with the arbitration.
- E. **Arbitration is Forum for Resolving Claims Other Than Those Identified Under Part 8 Above.** All Claims arising out of the Work shall be resolved by arbitration. The judgment upon the arbitration award may be entered, or review of the award may occur, in the superior court having jurisdiction thereof. No independent legal action relating to or arising from the Work shall be maintained.
- F. **Owner May Combine Claims into Same Arbitration.** Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in the same arbitration or mediation.

- G. **Settlement Outside of Arbitration to Be Documented in Change Order.** If the parties resolve the Claim prior to arbitration judgment, the terms of the resolution shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of the Claim, including all claims for time and for direct, indirect, or consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity.

8.03 CLAIMS AUDITS

- A. **Owner May Audit Claims.** All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractors of any tier, to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar any recovery.
- B. **Contractor to Make Documents Available.** In support of Owner audit of any Claim, Contractor shall, upon request, promptly make available to Owner the following documents:
 - 1. Daily time sheets and supervisor's daily reports;
 - 2. Collective bargaining agreements;
 - 3. Insurance, welfare, and benefits records;
 - 4. Payroll registers;
 - 5. Earnings records;
 - 6. Payroll tax forms;
 - 7. Material invoices, requisitions, and delivery confirmations;
 - 8. Material cost distribution worksheet;
 - 9. Equipment records (list of company equipment, rates, etc.);
 - 10. Vendors', rental agencies', Subcontractors', and agents' invoices;
 - 11. Contracts between Contractor and each of its Subcontractors, and all lower-tier Subcontractor contracts and supplier contracts;
 - 12. Subcontractors' and agents' payment certificates;
 - 13. Cancelled checks (payroll and vendors);

14. Job cost report, including monthly totals;
15. Job payroll ledger;
16. Planned resource loading schedules and summaries;
17. General ledger;
18. Cash disbursements journal;
19. Financial statements for all years reflecting the operations on the Work. In addition, the Owner may require, if it deems it appropriate, additional financial statements for 3 years preceding execution of the Work;
20. Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others;
21. If a source other than depreciation records is used to develop costs for Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents;
22. All nonprivileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in Contract Sum or Contract Time sought by each Claim;
23. Work sheets or software used to prepare the Claim establishing the cost components for items of the Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals; and
24. Work sheets, software, and all other documents used by Contractor to prepare its Bid.

- C. **Contractor to Provide Facilities for Audit and Shall Cooperate.** The audit may be performed by employees of Owner or a representative of Owner. Contractor, and its Subcontractors, shall provide adequate facilities acceptable to Owner, for the audit during normal business hours. Contractor, and all Subcontractors, shall make a good faith effort to cooperate with Owner's auditors.

PART 9: TERMINATION OF THE WORK

9.01 TERMINATION BY OWNER FOR CAUSE

- A. **Seven (7) Day Notice to Terminate for Cause.** Owner may, upon seven (7) Days written notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for cause upon the occurrence of any one or more of the following events:

1. **Contractor Fails to Prosecute Work.** Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time;
2. **Contractor Bankrupt.** Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency;
3. **Contractor Fails to Correct Work.** Contractor fails in a material way to replace or correct Work not in conformance with the Contract Documents;
4. **Contractor Fails to Supply Workers or Materials.** Contractor repeatedly fails to supply skilled workers or proper materials or equipment;
5. **Contractor Failure to Pay Subcontractors or Labor.** Contractor repeatedly fails to make prompt payment due to Subcontractors or for labor;
6. **Contractor Violates Laws.** Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or
7. **Contractor in Material Breach of Contract.** Contractor is otherwise in material breach of any provision of the Contract Documents.

- B. **Owner's Actions Upon Termination.** Upon termination, Owner may at its option:

1. **Take Possession of Project Site.** Take possession of the Project site and take possession of or use all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the Work;

2. **Accept Assignment of Subcontracts.** Accept assignment of subcontracts pursuant to Section 5.20; and
 3. **Finish the Work.** Finish the Work by whatever other reasonable method it deems expedient.
- C. **Surety's Role.** Owner's rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.
- D. **Contractor's Required Actions.** When Owner terminates the Work in accordance with this Section, Contractor shall take the actions set forth in Section 9.02B and shall not be entitled to receive further payment until the Work is accepted.
- E. **Contractor to Pay for Unfinished Work.** If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for A/E's services and expenses made necessary thereby and any other extra costs or damages incurred by Owner in completing the Work, or as a result of Contractor's actions, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner. These obligations for payment shall survive termination.
- F. **Contractor and Surety Still Responsible for Work Performed.** Termination of the Work in accordance with this Section shall not relieve Contractor or its surety of any responsibilities for Work performed.
- G. **Conversion Of "Termination for Cause" To "Termination for Convenience".** If Owner terminates Contractor for cause, and it is later determined that none of the circumstances set forth in Section 9.01A exist, then such termination shall be deemed a termination for convenience pursuant to Section 9.02.
- 9.02 TERMINATION BY OWNER FOR CONVENIENCE
- A. **Owner Notice of Termination for Convenience.** Owner may, upon written notice, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for the convenience of Owner.
- B. **Contractor Response to Termination Notice.** Unless Owner directs otherwise, after receipt of a written notice of termination for either cause or convenience, Contractor shall promptly:
1. **Cease Work.** Stop performing Work on the date and as specified in the notice of termination;
 2. **No Further Orders or Subcontracts.** Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated;
 3. **Cancel Orders and Subcontracts.** Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;
 4. **Assign Orders and Subcontracts to Owner.** Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;
 5. **Take Action to Protect the Work.** Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and
 6. **Continue Performance Not Terminated.** Continue performance only to the extent not terminated.
 7. **Owner's Property.** If the Contractor has any property in its possession belonging to STA, the Contractor will account for the same, and return it to STA or dispose of it in the manner STA directs.
- C. **Terms of Adjustment in Contract Sum If Contract Terminated.** If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus a reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.

- D. **Owner to Determine Whether to Adjust Contract Time.** If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

PART 10: MISCELLANEOUS PROVISIONS

10.01 GOVERNING LAW & VENUE

The Contract Documents and the rights of the parties herein shall be governed by the laws of the state of Washington. Venue shall be in the Superior Court of Spokane County, Washington.

10.02 SUCCESSORS AND ASSIGNS

Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party shall assign the Work without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents.

10.03 MEANING OF WORDS

Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority, whether such reference be specific or by implication, shall be to the latest standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in these Drawings and Specifications an article, device, or piece of equipment is referred to in the singular manner, such reference shall apply to as many such articles as are shown on the drawings or required to complete the installation.

10.04 EMPLOYEE SOLICITATION

Contractor, without the written consent of Owner, shall not directly or indirectly solicit, influence, entice or hire or attempt to solicit, influence, entice or hire any employee of Owner to: (a) cease employment with Owner; or (b) do business related to a business connected with the Contractor's

business during this Agreement and for a period of three (3) years from the date on which the Agreement terminates, or the Work is accepted by Owner, whichever is earlier. Owner's employees shall be deemed to be related to or connected with a Contractor if such Owner employee becomes (a) a partner in a general or limited partnership or employee of a partnership; or (b) a shareholder, officer, employee or director of a corporation, member, consultant or agent for the Contractor or any of Contractor's affiliates, subsidiaries or connected business. This Section shall survive the termination of the Contract. This Contract is not restricted to any geographical area.

Contractor recognizes and acknowledges that Owner's employees may receive training and other benefits from its contractual relationship with Owner because of Owner's assignment of employees to work in connection with the Contract. Contractor agrees the restrictions on soliciting, influencing, enticing or hiring Owner employees are reasonable.

10.05 RIGHTS AND REMEDIES

No action or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall action or failure to act constitute approval or an acquiescence in a breach therein, except as may be specifically agreed in writing.

10.06 CONTRACTOR REGISTRATION

Pursuant to RCW 39.06, Contractor shall be registered or licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27.

10.07 TIME COMPUTATIONS

When computing any period of time, the day of the event from which the period of time begins shall not be counted. The last day is counted unless it falls on a weekend or legal holiday, in which event the period runs until the end of the next day that is not a weekend or holiday.

10.08 PUBLIC RECORDS ACT

Each Party to the Contract understands and acknowledges the Owner is a municipal corporation of the State of Washington subject to the "Public Records Act", RCW 42.56 *et seq.*

Contractor understands and agrees that the records it obtains or produces under this Agreement may be public records under the Public Records Act, or its successor act. The Contractor shall cooperate in a timely manner with Owner in responding to a public records request ("PRR") related to this Agreement or the goods/services provided under this Agreement. Such cooperation shall include searching all records regarding the Work and producing all records that are potentially responsive to a PRR to Owner. Contractor shall mark and segregate all materials in its possession that may be protected by the Public Records Act to protect against inadvertent disclosure of such documents and to facilitate Owner's application of allowable Public Records Act exemptions. Contractor shall not charge Owner for the time spent gathering and producing records pursuant to a PRR.

10.09 RECORDS RETENTION

The wage, payroll and cost records of Contractor, and its Subcontractors created or used for the Project, shall be retained for a period of not less than six (6) years after the date of Final Acceptance.

10.10 THIRD-PARTY AGREEMENTS

The Contract Documents shall not be construed to create a contractual relationship of any kind between: A/E and Contractor; Owner and any Subcontractor, or any persons other than Owner and Contractor.

10.11 HEADINGS AND CAPTIONS

All headings and captions used in these GC are only for convenience of reference, and shall not be used in any way in connection with the meaning, effect, interpretation, construction or enforcement of the GC, and do not define the limit or describe the scope or intent of any provision of these GC.

10.12 ANTITRUST ASSIGNMENT

Owner and Contractor recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, Contractor hereby assigns to Owner any and all claims for such overcharges as to goods, materials and

equipment purchased in connection with the Work performed in accordance with the Contract Documents, except as to overcharges which result from antitrust violations commencing after the Contract Sum is established and which are not passed on to Owner under a Change Order. Contractor shall put a similar clause in its Subcontracts, and require a similar clause in its sub-Subcontracts, such that all claims for such overcharges on the Work are passed to Owner by Contractor.

10.13 CONFLICT OF INTEREST

No employee, officer or agent of Owner shall participate in the selection, award or administration of the Contract if a conflict of interest, real or apparent, would be involved. Such conflict would arise when:

- A. The employee, officer or agent;
- B. any member of his or her immediate family;
- C. his or her partner; or
- D. an organization which employs, or is about to employ, an employee, officer or agent of STA

has a financial interest in the firm, Contractor or Subcontractors, of any tier, selected for Award.

10.14 COUNTERPARTS

The Contract may be executed in one or more counterparts, each of which shall constitute an original Contract, but all of which together shall constitute one and the same instrument.

10.15 ELECTRONIC SIGNATURES

A signed copy of this Agreement or any other ancillary agreement transmitted by facsimile, email or other means of electronic transmission shall be deemed to have the same legal effect as delivery of any original executed copy of this Agreement or such other ancillary agreement for all purposes.

END OF SECTION 007200

SECTION 007300 - Supplemental Conditions

1. LIQUIDATED DAMAGES

The Contractor agrees to pay to STA liquidated damages in the amount of \$450.00 for each Day the Contractor fails to provide services or respond to an STA request for services hereinafter provided. These liquidated damages are for the purpose of any delay or impact caused to STA by virtue of the Contractor's acts or omissions and do not cover any other actual or consequential damages other than delay. STA and the Contractor agree that such damages cannot be reasonably determined at this time. Such damages are very difficult to accurately estimate because of numerous factors, including, but not limited to inconvenience to STA. Further, the Parties agree this is a reasonable forecast of all factors now known and available for consideration relating to the delay caused by Contractor's failure to perform. Liquidated damages shall be deducted from the Contract by Change Order.

2. RULE 171 – WAC 458-20-171

99.6% of this project qualifies as "public road construction" as described in WAC 458-20-171 ("Rule 171"), and therefore only materials used or consumed by the Contractor are subject to sales tax.

The Contractor shall pay all taxes, including sales tax, for the work or portions thereof provided by the Contractor and such taxes shall be included in 99.6% of the Contract amount.

State of Washington sales tax is payable on the "selling price" or "gross proceeds of sale" of the "tangible personal property" as these terms are defined in WAC 458-20-107 (Rule 107), except as excluded by WAC 458-20-171.

Contractors are advised that they are considered the end consumers of all material, including prefabricated and pre-cast items, equipment and supplies used or consumed by them in performing the Work, and must pay any applicable retail sales tax/use tax to their material men and suppliers. In order to maximize the sales tax exemption, Contractors are encouraged to have all material delivered to the job site for consumption. If the Contractor has questions about the application of Rule 171, the Contractor is advised to contact the Washington State Department of Revenue. However, any such communications must be communicated to STA's Director of Finance, prior to making contact with the Department of Revenue.

The Contract Amount must include labor, overhead, profit and applicable sales tax on material, pursuant to Rule 171. Contractors are cautioned against paying sales tax more than once on materials used or consumed, such as by paying sales tax to material men or suppliers, and again remitting sales tax to the state on total costs.

All applicable taxes which the Contractors are required to pay, including retail sales/use tax as specified above, shall be included by them in the Bid prices for the Work covered by their Bid. No adjustment will be made in the amount to be paid by STA under the Contract because of any misunderstanding by, or lack of knowledge of, the Bidder as to their liability for, or the amount of, any taxes or because of any increases in tax rates imposed by any federal, state or local government.

END OF SECTION 007300

SECTION 007346.1 – WA PREVAILING WAGE RATES – SPOKANE COUNTY

In the preparation of its Bid, based on these specifications, the Bidder is solely responsible to:

1. Use the prevailing wage schedule in effect for the Bid Due Date; and
2. Determine the appropriate labor classification(s); and
3. Utilize the appropriate and correct prevailing wage and benefit rate(s).

The State of Washington, Department of Labor and Industries issues revised wage schedules twice per year (every 6 months) which become effective approximately the first of March and the last of August. The wage schedule that will apply to this solicitation will be the schedule in effect as of the Bid Due Date. Therefore, the Bidder is cautioned to be mindful that Addenda changing the Bid Due Date could make the enclosed schedule obsolete. The Bidder is solely responsible to determine what schedule is applicable to this solicitation and to use that schedule in the preparation of its Bid.

The Prevailing Wage Documents for Public Works from the Washington State Department of Labor and Industries for Spokane County may be found on the Department of Labor and Industries website located at: <https://secure.lni.wa.gov/wagelookup>. Printed copies of the current prevailing wage schedules and forms are available by contacting STA in accordance with subsection 3 of Section 002100 – Instructions to Bidders.

Questions regarding prevailing wages should be directed to the State of Washington, Department of Labor & Industries, located at 901 N. Monroe St., Suite 100, Spokane, Washington, (509) 324-2600; or to PO Box 44540, Olympia WA 98504-4540; (360) 902-5335.

END OF SECTION 007346.1

SECTION 011000 - SUMMARY

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. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work performed by Owner.
5. Multiple Work Packages.
6. Work under Owner's separate contracts.
7. Future work not part of this Project.
8. Owner's product purchase contracts.
9. Owner-furnished/Contractor-installed (OFCI) products.
10. Owner-furnished/Owner-installed (OFOI) products.
11. Contractor-furnished/Owner-installed (CFOI) products.
12. Contractor's use of site and premises.
13. Coordination with occupants.
14. Work restrictions.
15. Specification and Drawing conventions.
16. Miscellaneous provisions.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

- A. Project Identification: STA Fueling Facility.

1. Project Location: 1229 W. Boone Ave. Spokane, WA

- B. Owner: Spokane Transit Authority, 1230 W. Boone Ave, Spokane, WA.
 - 1. Owner's Representative: Jessica Charlton.
- C. Engineer: Coffman Engineers, 10 N. Post Street, Suite 500, Spokane, WA 99201.
 - 1. Engineer's Representative: Shelby McGowan.
- D. Architect: ALSC Architects, 203 N Washington St, Suite 400, Spokane, WA 99201.
 - 1. Architect's Representative: Tina Johansen.
- E. Landscape Architect: SPVV Landscape Architects, 1908 W Northwest Blvd Suite A, Spokane, WA 99205.
 - 1. Landscape Architect's Representative: Tom Sherry.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. Closure of existing underground diesel tanks inside the main STA maintenance facility on Boone Ave.
 - 2. Installation of temporary soldier pile shoring walls (to remain).
 - 3. Installation of new concrete cast in place vaults with precast concrete lids.
 - 4. Installation of (3) new 20,000-gallon diesel tanks including all electrical and mechanical hook ups. Includes other various related tasks as shown on the contract drawings and documents.
 - 5. Various other site work as shown on the contract drawings.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
 - 1. Driveways, Walkways and Entrances: Keep driveways loading areas and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to normal business working hours of 8:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise allowed or restricted by City of Spokane.
 - 1. Alternative Hours: to be reviewed and approved in advance by Owner.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than ten days in advance of proposed utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to neighboring businesses and traffic operation.
 - 1. Notify Owner not less than ten days in advance of proposed disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages and other controlled substances on Project site is not permitted.

- F. Employee Identification: Owner will provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

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. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard 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 011000

SECTION 013100 - 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. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Owner 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.

1.5 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.

1.6 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. Engineer will return without response those RFIs submitted to Engineer 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. Date.
 - 5. Name of Contractor.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title and related paragraphs, as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. 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. Engineers Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Engineer's response for each RFI. RFIs received by Engineer 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.
- D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number.
1. Project name.
 2. Name and address of Contractor.
 3. RFI number, including RFIs that were returned without action or withdrawn.
 4. RFI description.
 5. Date the RFI was submitted.
 6. Date response was received.
- E. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within 3 days if Contractor disagrees with response.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 014000 - 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 quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Owner, Coffman Engineers, Inc, and Budinger & Associates, Inc. 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 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. 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.
- E. 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.
- F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- G. 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."
- H. 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.
- I. 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 Owner. .

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 Owner..
- 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 Owner regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Owner 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 Owner for a decision before proceeding.

1.6 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. 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.
- D. 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.
- E. Reports: Prepare and submit certified written reports and documents as specified.
- F. 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.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within ten (10) days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Owner. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.
 2. Before starting work, Contractor shall submit the name, qualifications, and experience of the proposed QC manager for approval. Ideally, the QC manager should have a minimum of 5-10 years of construction-related QC or QA experience. Relevant certification by ASQ is also highly desirable. At a minimum, the designated QC manager shall have significant prior construction experience at the level of a Project/Site Superintendent for a GC contract on projects with similar construction tasks and activities, and who also had prior ongoing QC responsibilities while serving in these roles.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. 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.
- E. 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.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Owner 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.

1.8 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.

1.9 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 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. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - 5. When testing is complete, remove test specimens and test assemblies; do not reuse products on Project.
 - 6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Owner, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.10 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 012100 "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 twenty-four (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 Owner and Engineer of Record and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Owner, Engineer of Record, 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 quality-control 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 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. 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.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. 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, Engineer of Record, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 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, as indicated in the Statement of Special Inspections and contract documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "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.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS GENERAL

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 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 017300 "Execution" for progress cleaning requirements.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Engineer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Engineer, occupants of Project, testing agencies, and authorities having jurisdiction.

1.5 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. Implementation and Termination Schedule: Within fifteen (15) days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

- D. Sustainable Design Plan: Install temporary erosion and sediment control devices per C1.2 – Erosion and Sediment Control Plan. Contractor personnel responsible for management of erosion and sediment control measures shown on plan.
- E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- F. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- G. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.
- H. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
 - 1. Methods used to meet the goals and requirements of the Owner.
 - 2. Concrete cutting method(s) to be used.
 - 3. Rock excavations method(s) to be used.
 - 4. Location of construction devices on the site.
 - 5. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 - 6. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
 - 7. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.6 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.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete bases for supporting posts.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Owner from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches (914 by 1524 mm).
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Contractor and construction personnel office activities. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
 2. Conference room if needed of sufficient size to accommodate contractor's activities. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
 3. Drinking water and private toilet.
 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system.
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. 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 011000 "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.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 2. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

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. Sanitary Facilities: Provide temporary toilets, wash 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.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 321216 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated off site public parking areas for construction personnel.
- F. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- G. 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.
- H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- I. Waste Disposal Facilities: Comply with local codes and ordinances.
- J. 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 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of authorities having jurisdiction and the construction documents, whichever is more stringent.
 - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 2. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 3. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress, from exposure, foul weather, other construction operations, and similar activities.
- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 4. Insulate partitions to control noise transmission to occupied areas.
 - 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 6. Protect air-handling equipment.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- K. 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. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

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.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for forty-eight (48) hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for forty-eight (48) hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Owner.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within forty-eight (48) hours.

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. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

- D. 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. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified for "Closeout Procedures."

END OF SECTION 015000

SECTION 017300 – EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.
 - 10. Correction of the Work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, Owner's separate contracts, and limits on use of Project site.

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

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

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

B. Layout Conference: Conduct conference at Project site.

1. Prior to establishing layout, review location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Owners representative of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Contractor's qualified professional surveyor responsible for performing Project surveying and layout.
 - c. Contractor's qualified professional surveyor responsible for performing site survey serving as basis for Project design.
2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certified Surveys: Submit an electronic copy signed by land surveyor.
- C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least ten (10) days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Owner and Engineer of Record of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Sprayed fire-resistive material.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. 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.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Owner's Representative in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Owner's Representative promptly.
- B. Engage a land surveyor/professional engineer experienced in laying out the Work, using the following accepted surveying practices:
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Owner's Representative when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owners Representative.

3.4 FIELD ENGINEERING

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

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb, and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owners Representative.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

- 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. 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.
- C. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Owner. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will 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. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.8 STARTING AND ADJUSTING
- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

- 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: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 024119 - SELECTIVE DEMOLITION

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 the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
- B. Work and materials shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, work and materials shall comply with the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.
- C. Related Sections include the following:
 - 1. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- C. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- D. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- E. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- F. Existing to Remain: Existing facilities, utilities, or other improvements to be protected and that are not otherwise indicated to be recycled, removed, removed and salvaged, or removed and reinstalled.

- G. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- H. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.
- I. 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.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

- 1. Coordinate with Owner, who will establish procedures for removal and salvage.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- E. 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.
- F. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- C. Hazardous Materials: Hazardous materials will be encountered during the Work.
 - 1. Hazardous materials have been identified within the project footprint. Contractor to assume 20 tons of impacted soil to be removed from site and disposed of properly (based on an estimated 1.5 TON/CY). Approximate extents of impacted soils is shown on C1.1 – Demolition Plan. Coordinate removal of contaminated soils with Budinger & Associates, Inc. A representative from Budinger & Associates must be present when working on or near the impacted soils.
 - 2. If materials suspected of containing hazardous materials are encountered that have not been previously identified, do not disturb; immediately notify Budinger & Associate, Inc. Budinger & Associates to provide direction for removal and disposal of impacted soils. Unit pricing from bid form to be used in the event of additional removal and disposal of non-identified impacted soils is needed.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 31 Section “Earth Moving”.

2.2 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 ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.

- B. Field verify existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- E. If unanticipated elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building and existing facilities.
 - 3. Cut off pipe or conduit to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to existing construction to remain.

3. Protect existing facilities, utilities, and other improvements that are to remain or that are exposed during selective demolition operations.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 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. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Concrete or Asphalt: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 5. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations. Fire watch duration shall conform with regulations of the governing fire department.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly.
 11. Proceed with patching after construction operations requiring cutting are complete.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations 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. Restore damaged pipe covering to its original condition.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 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.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

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

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
- E. Samples: For waterstops and vapor retarders.

- F. Qualification Data: For manufacturer.
- G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- H. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
- I. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- J. Field quality-control reports.
- K. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, will be employed by the owner, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

2. Personnel performing laboratory tests shall be 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.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specification for Structural Concrete,"
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. 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.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will 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.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.4 REINFORCEMENT ACCESSORIES

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

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I/II,
 - a. Fly Ash: ASTM C 618, Class F or C. 25% maximum by weight as required to achieve LEED credits.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: As per contract documents.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 3. For exposed exterior surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

4. Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to the Owner.

D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 WATERSTOPS

A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

1. Products:
 - a. JP Specialties, Inc.; Earth Shield TPE-Rubber.
 - b. Vinylex Corp.; PetroStop.
 - c. WESTEC Barrier Technologies, Inc.; 600 Series TPE-R.
2. Profile: Flat, dumbbell with center bulb
3. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.75 mm thick)

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra.
 - b. Raven Industries Inc.; Vapor Block 10.
 - c. Reef Industries, Inc.; Griffolyn Type-85.
 - d. Stego Industries, LLC; Stego Wrap, 10 mil Class C.

2.9 FLOOR AND SLAB TREATMENTS

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products:
- a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edoco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - p. Unitex; Pro-Film.
 - q. US Mix Products Company; US Spec Monofilm ER.
 - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 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 C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 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 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: 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 C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping 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 topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi (at 28 days when tested according to ASTM C 109/C 109M).

2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Provide mixes as indicated on the structural drawings.

2.15 FABRICATING REINFORCEMENT

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

2.16 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm)
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

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

3.3 REMOVING AND REUSING FORMS

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

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

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

7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- A. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- B. Isolation Joints in Slabs-on-Grade: 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.
 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 079200 "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.

3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicate to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155 for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
3. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to 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. Testing and Inspecting: The Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Headed bolts and studs.
 - 4. Verification of use of required design mixture.
 - 5. Concrete placement, including conveying and depositing.
 - 6. Curing procedures and maintenance of curing temperature.
 - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; 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 C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 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 laboratory-cured 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 (3.4 MPa).
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. 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.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

SECTION 034100 - PRECAST STRUCTURAL CONCRETE

1.1 SUMMARY

A. Section Includes:

1. Precast structural concrete.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
2. Section 055000 "Metal Fabrications" for kickers and other miscellaneous steel shapes.
3. Section 071900 "Water Repellents" for water-repellent finish treatments.

1.2 DEFINITIONS

- A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.

C. Shop Drawings:

1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate type, size, and length of welded connections by AWS standard symbols.
5. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
6. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
7. Include and locate openings larger than 10 inches. Where additional structural support is required, include header design.
8. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
9. Indicate relationship of precast structural concrete units to adjacent materials.

10. Indicate shim sizes and grouting sequence.
 11. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- D. Delegated Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from precast structural concrete.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C. Material Certificates: For the following:
1. Cementitious materials.
 2. Reinforcing materials.
 3. Admixtures.
 4. Bearing pads.
 5. Insulation.
 6. Structural-steel shapes and hollow structural sections.
- D. Material Test Reports: For aggregates, by a qualified testing agency.
- E. Preconstruction test reports.
- F. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
1. Designated as a PCI-certified plant as follows:
 - a. Group C, Category C1 - Precast Concrete Products (no prestressed reinforcement)
- B. Required Certified Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance, to erect Category S1 - Simple Structural Systems.

- C. Installer Qualifications: An experienced precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S1 – Simple Structural Systems and who can produce an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."
- D. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
- E. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

1.7 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.
- B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
 - 1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
 - 2. Place adequate dunnage of even thickness between each unit.
 - 3. Place stored units so identification marks are clearly visible, and units can be inspected.
- C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
- D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Knife River Precast

- B. Wilbert Precast
- C. Missoula Precast
- D. Other equivalent manufacturer capable of meeting requirements of this specification.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design precast structural concrete units
- B. Design Standards: Comply with ACI 318 (ACI 318M) and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.
- C. Structural Performance:
 - 1. Precast structural concrete units and connections to withstand design loads indicated within limits and under conditions indicated.
 - 2. Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - a. Dead Loads: Self weight
 - b. Live Loads: See structural drawings.
 - c. Snow Loads: See structural drawings
 - d. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318 (ACI 318M).
 - 1) Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 18 to plus 120 deg F
 - e. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating.

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
 - 1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

2.4 REINFORCING MATERIALS

- A. Epoxy-Coated Reinforcing Bars: ASTM A615/A615M, Grade 60
- B. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type III, gray, unless otherwise indicated.
 - 1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C618, Class N.
 - 3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
 - 1. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate to match approved finish sample.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- D. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
 - 1. Water-Reducing Admixtures: 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. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
 - 5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 7. Plasticizing Admixture: ASTM C1017/C1017M, Type I.
 - 8. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
 - 9. Corrosion-Inhibiting Admixture: ASTM C1582/C1582M.

2.6 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M.

- B. Carbon-Steel-Headed Studs: ASTM A108, Grade 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.
- C. Carbon-Steel Castings: ASTM A27/A27M, Grade 60-30 (Grade 415-205).
- D. Carbon-Steel Structural Tubing: ASTM A500/A500M, Grade B or Grade C.
- E. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M or ASTM A153/A153M.
 - 1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
 - 2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

2.7 BEARING PADS

- A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:
 - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D2240; minimum tensile strength 2250 psi (15.5 MPa), ASTM D412.
 - 2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D2240; capable of supporting a compressive stress of 3000 psi (20.7 MPa) with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
 - 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.

2.8 ACCESSORIES

- A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

2.9 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 2. Limit use of fly ash to 20 percent replacement of portland cement by weight and ground granulated blast-furnace slag to 20 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 116 when tested according to ASTM C1218/C1218M.
- D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: For structural precast concrete with an architectural finish, limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.
- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.10 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

2.11 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
 - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 - 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 - 3. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 - 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- G. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- H. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

- I. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.
- J. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.
- K. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.
- L. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- M. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.12 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.13 COMMERCIAL FINISHES

- A. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch (13 mm) caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch (6 mm) in width that occur more than once per 2 sq. in. (1300 sq. mm). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch (3 mm).
- B. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

2.14 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
 - 1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide

samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

- B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712/C1712M.
- C. Strength of precast structural concrete units is considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.
- D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42/C42M.
 - 1. A minimum of three representative cores to be taken from units of suspect strength, from locations directed by Architect.
 - 2. Test cores in an air-dry condition or, if units are wet under service conditions, test cores after immersion in water in a wet condition.
 - 3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 - 4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
 - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Field cutting of precast units is not permitted without approval of Architect.
- E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.
- F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
 - 1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.

2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A780/A780M.
 3. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.
- G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
 2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:
 - a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
 - b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
 - c. Twist-off Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
 - d. Direct-Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
 3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

3.3 ERECTION TOLERANCES

- A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
- B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 REPAIRS

- A. Repair precast structural concrete units if permitted by Architect.
 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.5 CLEANING

- A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034100

SECTION 055000 - 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. Products furnished, but not installed, under this Section include the following:
 - 1. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

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

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- 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.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

- D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bar Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) 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 will be 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.
1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Galvanize miscellaneous framing and supports where indicated.

2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

2.8 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless primers specified in Division 09 Section "High-Performance Coatings" are indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Other Items: SSPC-SP 3, "Power Tool Cleaning."

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.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 071700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provide a composite sheet membrane waterproofing system.
2. Work includes all applicable sealants, waterstops, and waterproofing accessories needed to ensure a complete waterproofing system for buried concrete and shoring at locations indicated.

B. Related Work:

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

1.2 RELATED REQUIREMENTS

1. Section 312000 "Earth Moving" for excavating and backfilling[, including requirements for preparation of substrates to receive bentonite waterproofing].
2. Section 315000 "Excavation Support and Protection" for permanent below-grade support systems that require blind-side waterproofing[, including requirements for preparation of substrates to receive bentonite waterproofing].

1.3 REFERENCES

A. References, General: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.

B. ASTM International (ASTM): www.astm.org:

1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants
2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
3. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
4. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
5. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
6. ASTM D4716 - Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
7. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

8. ASTM D5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
9. ASTM E96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials
10. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
11. ASTM D903* - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; **modified*
12. ASTM E331* - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; **modified*
13. ASTM C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course

C. UL Environment Greenguard Certification: www.greenguard.org

1. Greenguard Certification Product Guide

D. U. S. Environmental Protection Agency (EPA): www.epa.gov:

1. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project Site.

1. Review requirements for waterproofing products and installation with manufacturer's representative employed by the manufacturer. This includes surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of waterproofing work with work of other Sections.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of waterproofing product specified, including:

1. Technical data indicating compliance with requirements.
2. Substrate preparation instructions and recommendations.

B. Shop Drawings: Show locations for waterproofing system components. Show details for each type of substrate, joints, corners, and edge conditions, including flashings, counterflashings, penetrations, transitions, and terminations.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type of product, from manufacturer.

- B. Qualification Data: For Installer, manufacturer[, and waterproofing Inspector].
 - 1. Certification of manufacturer's approval of Installer.
- C. Product Test Reports: Test data for waterproofing products and waterproofing system, by qualified testing agency, indicating proposed waterproofing meets performance requirements, when requested by Architect.
- D. Warranty: Sample of manufacturer and installer special warranties.
- E. Field quality control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A manufacturer-approved firm with minimum [three] years' experience in installation of specified products in successful use on similar projects, employing workers trained by manufacturer, including a full-time on-site supervisor with a minimum of ten years' experience installing similar work, and able to communicate verbally with Contractor[, Architect,] and employees.
- B. Manufacturer Qualifications: A qualified manufacturer [listed in this Section] with minimum ten years experience in manufacture of waterproofing as one of its principal products.
 - 1. Approval of Manufacturers and Comparable Products: [Submit] [Prime Bidder must submit] the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Sample shop drawings from similar project.
 - c. Project references: Minimum of three installations of similar system not less than five years old, with Owner and Architect contact information.
 - d. Name and resume of proposed qualified Inspector.
 - e. Sample warranty.
- C. Testing Agency Qualifications: Qualified independent agency experienced in the installation of the specified waterproofing system, and qualified to perform observation and inspection specified in Field Quality Control Article to determine Installer's compliance with the requirements of this Project, acceptable to Architect, retained by the Contractor.
- D. Mockups: Provide waterproofing mockup application within mockups required in other sections, or if not specified, in an area of not less than 150 sq. ft. (14 sq. m) of surface where directed by Architect for each type of substrate condition. Include examples of surface preparation, crack and joint treatment, waterproofing application, and flashing, transition, and termination conditions, to set quality standards for execution.
 - 1. Include intersection of waterproofing with adjacent waterproofing and moisture control systems.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in manufacturer's unopened original packaging.
- B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by waterproofing manufacturer.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing and fluid-applied membrane to be installed according to manufacturers' written instructions and warranty requirements.
 - 1. Do not install waterproofing during rain, mist or heavy fog. If rain, mist or snow is anticipated before the asphaltic membrane has been applied, cover any exposed bentonite or seams with min. 6 mil polyethylene sheet.
 - 2. Placing bentonite clay products on damp surfaces is allowed if approved in writing by manufacturer.

1.10 SCHEDULING

- A. Schedule work so waterproofing applications may be inspected prior to concealment.

1.11 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which waterproofing manufacturer agrees to furnish waterproofing material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
 - 1. Access for Repair: Owner shall provide unimpeded access to the Project and the waterproofing system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding and overburden materials upon completion of repair.
 - 2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the materials.
 - a. Special labor and materials warranty is available for preapproved, qualifying projects.
 - 3. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: Provide waterproofing products manufactured by **Tremco, Inc., Commercial Sealants and Waterproofing Division**, Beachwood OH; (866) 321-6357; email: techresources@tremcoinc.com; www.tremcosealants.com, or equivalent alternative pre-approved by owner.
- B. Source Limitations: Provide waterproofing system materials and accessory products from Tremco, a single-source system manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Waterproofing system shall be capable of performing as a continuous, watertight installation and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Waterproofing shall accommodate normal substrate movement, construction material transitions, opening transitions, penetrations, and perimeter conditions without resultant moisture deterioration.
- B. Compatibility: Provide waterproofing system materials that are compatible with adjacent materials under conditions of service and substrates on which product is applied, as recommended by waterproofing manufacturer based on testing and field experience.

2.3 COMPOSITE HDPE/BENTONITE MEMBRANE

- A. **Composite HDPE/Bentonite Membrane:** Composite membrane consisting of a 20-mil- (0.5-mm-) thick, HDPE geomembrane liner bonded with up to 1.0 lb./sq. ft. (4.9 k/sq. m) layer of bentonite clay granules overlaid with protective scrim cloth.
 - 1. Basis of Design Product: **Tremco, Inc., Paraseal LG** or equivalent alternative preapproved by owner.
 - 2. Puncture Resistance, ASTM E154: Not less than 155 lbf (689 N).
 - 3. Tensile Strength, ASTM D412: 4,000 psi (28 MPa).
 - 4. Elongation, ASTM D412: Not less than 500 percent.
 - 5. Vapor Permeance, ASTM E96: Not greater than 0.03 perms.
 - 6. Resistance to Hydrostatic Head, ASTM D5385: 231 feet (70.1 m).
 - 7. Color: Gray/black.

2.4 ACCESSORY MATERIALS

- A. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a No. 20 (0.85-mm) sieve.
 - 1. Basis of Design Product—**Tremco, Inc., Paragranular** or equivalent alternative preapproved by owner.

- B. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.
 - 1. Basis of Design Product – **Tremco, Inc., Paramastic** or equivalent alternative preapproved by owner.
- C. Termination Bar: Extruded-aluminum or formed-stainless-steel bars with upper flange to receive sealant.
 - 1. Basis of Design Product – Tremco, Inc., Paraseal Paraterm Bar or equivalent alternative preapproved by owner.
- D. Plastic Protection Sheet: Polyethylene sheeting complying with ASTM D 4397; thickness recommended by waterproofing manufacturer to suit application but at least 6 mils (0.15 mm) thick.
- E. Cement Grout Patching Material: Manufacturer's recommended grout mix compatible with substrate being patched.
- F. Masonry Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners. Depending on manufacturer's written requirements, provide 1/2- or 1-inch- (13- or 25-mm-) diameter washers under fastener heads.
- G. Tapes: Waterproofing manufacturer's recommended tape for joints between sheets, membranes, or panels. Use with recommended adhesive bonding primer.
 - 1. Non-Reinforced Overlap Tape: Non-reinforced, adhesive tape of partially cross-linked polymeric elastomers 2 by 1/8 inch (50 by 3.2 mm) for molding form-fit seals around contours and for taping seams within overlaps.
 - a. Basis of Design Product – **Tremco, Inc., Para JT** or equivalent alternative preapproved by owner.
- H. Waterstops: Flexible, reinforced, bentonite-laminate waterstop strips 1/2 by 1 inch (12 by 25 mm) with pressure-sensitive adhesive backing for sealing static cold joints in concrete.
 - 1. Basis of Design Product – **Tremco, Inc., Superstop** or equivalent alternative preapproved by owner.
- I. Joint Sealants: Termination Seals:
 - 1. Single component, high performance, medium-modulus, low-VOC, UV-stable, non-sag polyurethane sealant.
 - a. Basis of Design Product: **Tremco Inc.; Dymonic 100.** or equivalent alternative preapproved by owner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Surface Condition: Before applying waterproofing materials, examine substrate conditions. Proceed with installation once unsatisfactory conditions have been corrected.

3.2 INTERFACE WITH OTHER WORK

- A. Sequencing of Work: Coordinate sequencing of waterproofing installation with work of other sections that form portions of building envelope moisture control to ensure that flashings and transition materials can be properly installed and inspected.
- B. Subsequent Work: Coordinate waterproofing installation with work of other sections installed subsequent to waterproofing to ensure complete inspection of installed waterproofing and sealing of waterproofing penetrations necessitated by subsequent work.

3.3 PREPARATION

- A. Clean, prepare, and treat substrates.. Fill voids with cement grout or Paramastic as recommended by manufacturer.
- B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, form-tie holes, and other defects greater than 1/4 inch (6 mm) in depth.
- C. Horizontal Concrete Surfaces: Remove standing water, debris, and substances that may impair bonding of patching materials or effectiveness of waterproofing. Fill voids and other defects greater than 1/4 inch (6 mm) in depth.
- D. Excavation Support and Protection System: Fill minor gaps and spaces 1 inch (25 mm) wide or wider with appropriate filling material. Cover or fill large voids and crevices.

3.4 INSTALLATION, GENERAL

- A. Install waterproofing and accessories according to manufacturer's written instructions. Protect bentonite material from wetting prior to liquid-applied membrane placement.
 - 1. Install a continuous layer of waterproofing membrane with ends and edges lapped a minimum of 4 inches (127 mm). Stagger end joints, seal laps and treat fastener penetrations.
 - 2. Apply Paragranular around penetrations in horizontal surfaces and changes in plane according to manufacturer's details.
 - 3. Apply Paramastic at changes of plane, construction joints in substrate, projections, and penetrations.
- B. Protect waterproofing from damage and wetting during construction. Repair punctures, tears, and cuts according to manufacturer's written instructions.

3.5 VERTICAL BLINDSIDE WALL WATERPROOFING

- A. Install Paraseal membrane with the gray, bentonite side to be in direct contact with inside face of shoring panels
- B. Verify which penetrations must be accessed after concrete placement for completion of waterproofing detail treatment and ensure that sufficient access to membrane is provided within a wood formed box out; verify which penetrations will not be accessed after concrete placement for completion of waterproofing detail treatment and ensure that final detailing procedures are completed prior to shotcreting; waterproof penetrations in accord with manufacturer's current procedures; contact manufacturer for procedures at project conditions not provided in installation manuals.
- C. Prevent waterproofing products from hydrating before material is coated with liquid-applied membrane. When threat of rain is imminent, installed products not already coated should be covered with polyethylene sheeting to decrease the chance of hydration. After any precipitation, pump standing water off waterproofing as soon as possible and repair damaged membrane.
- D. Excavation Support and Protection: Cut, clean, and treat tiebacks and similar projections. Encase tieback rods, nuts, and plates. If water is present, cover shoring and lagging with plastic protection sheets. If water is present, set up a dewatering system to remove water.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to Architect.
- B. Reporting: Forward written inspection reports to the Architect of the inspection and test being performed.
- C. Correction: Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

END OF SECTION 071700

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Silicone joint sealants.
- 2. Urethane joint sealants.
- 3. Latex joint sealants.

- B. Related Requirements:

- 1. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- E. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- F. Colors of Exposed Joint Sealants: As selected by Architect.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, non-sag, plus 50 percent and minus 50 percent movement capability, non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sika Corporation; Joint Sealants.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Bostik, Inc.
 - c. LymTal International Inc.
 - d. Pecora Corporation.
 - e. Sherwin-Williams Company (The).
 - f. Sika Corporation; Joint Sealants.
 - g. Tremco Incorporated.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, non-sag, plus 25 percent and minus 25 percent movement capability, non-traffic-use, acid- curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Soudal USA.
 - e. Tremco Incorporated.

2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Franklin International.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sherwin-Williams Company (The).
 - f. Tremco Incorporated.

2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Construction Foam Products; a division of Nomaco, Inc.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- 3.5 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.6 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:
 - a. Control and expansion joints in pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Joints in paving units, including steps.
 - e. Tile control and expansion joints.
 - f. Joints between different materials listed above.
 - g. Other joints as indicated on Drawings.
2. Joint Sealant: Urethane, M, P, 50, T.
3. Joint-Sealant Color: Submit color options to Architect for selection.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints between metal panels.
 - e. Joints between different materials listed above.
 - f. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - g. Control and expansion joints in ceilings and other overhead surfaces.
 - h. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: Submit color options to Architect for selection.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated on Drawings.
 - d. Control joints in concrete floors exposed to view.
2. Joint Sealant: Urethane, M, P, 25, T.
3. Joint-Sealant Color: Match Architect's sample.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.

- c. Vertical joints on exposed surfaces of concrete walls and partitions.
 - d. Other joints as indicated on Drawings.
 - e. Control joints in concrete floors exposed to view.
 - 2. Joint Sealant: Urethane, S, NS, 25, NT.
 - 3. Joint-Sealant Color: Submit color options to Architect for selection.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces not subject to significant movement.
- 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: Submit color options to Architect for selection.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
- 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: Submit color options to Architect for selection.
- G. Joint-Sealant Application: Concealed mastics.
- 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Butyl-rubber based.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081613 - FIBERGLASS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SCOPE AND DEFINITIONS

- A. Furnish and install doors, frames of FRP composite construction in accordance with details and schedule shown on the project drawings and as specified herein.
- B. FRP is defined as “Fiberglass Reinforced Polyester”

1.2 RELATED SECTIONS

- A. Section 087000: Hardware

1.3 QUALITY ASSURANCE

- A. Referenced Standards.
 - 1. American Society for Testing and Materials (ASTM)
 - 2. Society of Automotive Engineers (SAE)
 - 3. International Building Code, Plastics (Chapter 26)
 - 4. UL 10b and UL 10c, NFPA 252 and UBC7-2
- B. Experience: Manufacturer shall be engaged in the manufacture of FRP door and frame systems for a minimum of twenty five (25) years documented experience prior to the start of this work, and who has a history of successful production acceptable to the Architect.
- C. Referenced Standard: Where labeled fire doors are required, Fiberglass Doors and frames shall be UL listed and shall be tested successfully to UL10B / UL10C, UBC 7-2 standards.
- D. Process: Certify that FRP doors are manufactured via press-molding technology.
- E. Warranty: Provide written limited guarantee for FRP doors and frames as follows:
 - 1. Fiberglass Fire Doors are guaranteed for 10 years against delamination due to corrosion from the specific chemical environment named at the time of purchase. Furthermore, all products are inspected prior to shipment and guaranteed against defective workmanship for a period of ten (10) calendar years after the date of purchase.

1.4 SUBMITTALS

- A. Product Data: Provide catalog cut of FRP door detailing internal construction and reinforcements, materials used and description of molding process.

- B. Shop Drawings: To include the following specific information:
 - 1. Specifications relating to FRP door thickness, resin type, core material, method of construction, finish color, type of glass and glazing, anchor systems, joint construction and complete warranty information.
 - 2. Complete schedules or drawings of FRP doors and frames (and associated Builders Hardware) showing identifying mark numbers, door and frame types, typical elevations, nominal sizes, handing, actual dimensions and clearances, and required hardware preps and reinforcements.
 - 3. Supporting reference drawings pertaining to frame mounting details, door lite or louver installation, hardware locations, and factory hardware cutouts and reinforcements.
- C. Color Samples: Provide a complete set of available finish colors from the manufacturer for color selection upon request.
- D. Installation Instructions: Include manufacturer's specific information describing procedures, sequence and required fasteners for frame and door installation.
- E. Production of FRP doors and frames shall not proceed until final approval of submittals and all necessary manufacturing information is received from customer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. FRP doors and frames are to be delivered to jobsite in adequate crating with foam sheet separations between all components.
- B. Upon receipt of shipment, remove and inspect the doors and frames for damage. Note any damage on the shipping papers prior to accepting. If there is any noted (visible or concealed) damage, notify Tiger Door at 1-888-891-4416 immediately.
- C. Handling and storage of the doors and frames after receipt is the responsibility/liability of the customer. It is recommended that the doors be stored indoors in a vertical position, clear of the floor, with blocking between the doors to permit air circulation between the doors and prevent damage to the door faces. Rain/water or condensation must not be allowed to collect or lay between stored doors. Do not wrap in plastic sheeting as it will promote condensation formation within. Permanent discoloration can result. Failure to comply with the receiving and reporting instructions shall void the Tiger Door warranty.
- D. Use care in handling FRP doors and frames to prevent damage to factory finishes. Wear protective gloves and do not slide or drag doors or frames against one another

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. FRP Doors and Frames shall be as manufactured by Tiger Door, 5224 FM 802, Brownsville, TX 78521. Ph 888-891-4416 – www.tigerdoor.com.

2.2 FRP DOORS

A. FRP Doors:

1. Design: FRP doors shall be of seamless press-molded construction. Laminated FRP face sheets shall be applied while wet and uncured to an internal door stile and rail subframe/core assembly and then press-molded under heat and pressure. The composite door panel must be integrally fused over its entire surface area, not just adhesive-bonded at perimeter stiles and rails. Doors shall remain under pressure during curing for flat, warp-free surfaces.
2. Core: For maximum rigidity and compressive strength a mineral core shall be used. Molding pressure and resin gel time shall be sufficient to allow for penetration of resin into the cellular structure of the core to maximize shear and peel strengths at the skin/core interface and reduce the possibility of delamination. The mineral core is to be completely enclosed within the FRP laminated edge perimeter.
3. Faces: Door facings shall be 0.120" composite FRP sheet exterior grade, fiber reinforced plastic panel on interior and exterior faces. Colored pigment shall be maximum amount formulated with the resin. FRP face sheets shall be USDA acceptable, non-porous, with a maximum flame spread rating of 200, and smoke generated maximum of 450 degrees meeting Class C requirements per ASTM E84.
4. Finish: The exposed FRP door faces shall have a 3-4 mils (wet) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Coating shall have a minimum hardness of H to 2H. Finish shall be a slightly textured semi-gloss to minimize the visual effects of wear and tear.
5. Astragals: Provide a heavy pultruded FRP angle astragal on the meeting stile edge of each inactive leaf of double door pairs.
6. Lites: Provision for door lites shall be performed during manufacture and shall not be attempted in the field. Cutouts are to be totally enclosed by internal high density fire resistant mineral core composite blocks incorporated into door subframe prior to press-molding and machining, the opening is completely fused to both door skins. Vision frames shall be a commercially available UL fire rated kit. Maximum glass size shall not exceed 1296 in² for up to a 90 minute application.
7. Size limitations: The maximum double door jamb opening size shall not exceed nominal 8' - 0" x 8' - 0" with a maximum single door panel size not to exceed nominal 4' - 0" x 8' - 0".

2.3 FRP FRAMES

A. Frames:

1. Design: FRP Door frames furnished under this specification shall utilize a high-modulus pultruded structural FRP shape. Standard frame profile is a double rabbeted 5-3/4" depth x 2" face, 3/16" thick, with integral 5/8" doorstop. The minimum frame section shall be limited to a 4" jamb depth, 1" face. Four inch header and expanded profiles are acceptable.
2. Corner Joints: Jambs and header shall be joined at corners via miter connections with hidden stainless steel flat head screws.

3. Anchors:
 - a. BOLT-IN: Provide manufacturer's required number of 3/8" diameter x 4" long flat head stainless-steel sleeve anchors for masonry openings, 3/8" diameter x 4" machine screw with nut and washers for structural steel openings, #14 x 4" stainless steel flat head sheet metal screws for wood or steel stud openings. Include extra anchors for additional frame height in two foot increments above 8'-0". Provide single bolt anchor at center of all headers over four feet in nominal width. Stainless steel fasteners shall be furnished by the factory.
 - b. GROUT-IN: Provide manufacturer's required number of wire or strap type masonry anchors for installation into block wall. Fill frame cavity with grout.
4. Finish: Frames shall have a 3-4 mils (wet) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Industrial urethane chemical coating color topcoat, to match the color and sheen of the doors, for superior weatherability. Gelcoat may not be sprayed onto the frame as a secondary coating.

2.4 MECHANICAL PROPERTIES AND TEST PERFORMANCE

- A. Pultruded structural shapes for edges, frames, and astragals shall exhibit the following minimum longitudinal coupon properties (per ASTM):
 1. Tensile strength (D638) 30,000 psi
 2. Compressive strength (D695) 30,000 psi
 3. Flexural strength (D790) 30,000 psi
 4. Flexural modulus (D790) 1,600,000 psi
 5. Shear strength (D2846) 4,500 psi
 6. Impact, notched (D256) 25 ft-lb/in
 7. Barcol hardness (D2853) 50
- B. Core material shall exhibit the following minimum properties:
 1. Core material must comply with the International Building Code (IBC) chapter 26 requirements for use with a plastic skin.
 2. Core material must be asbestos free incombustible mineral composition.
- C. Core banding material shall exhibit the following minimum coupon properties (per ASTM):
 1. Core banding material must comply with the International Building Code (IBC) chapter 26 requirements for use with a plastic skin.
 2. Modulus of Rapture (C133) 1700 psi
 3. Compressive Strength (C109-93) 2800 psi
 4. Thermal Conductivity 946 F (C182) 1.38 (BTU-in/hr-ft²-F)
 5. Thermal Conductivity 1632 F (C182) 1.39 (BTU-in/hr-ft²-F)
 6. Shrinkage average % (C356) at 1200 F 24 hours -4.7%
 7. Screw Holding 1100 lbs.
 8. Electrical Resistivity from ambient to 1148 F (D257) 3.40 E+10 ohm-cm
 9. Heat Transfer for unexposed surface rise above ambient 90 minute, 1772 F (E 152) 196 F
 10. Density minimum 60 lb./ft³
 11. Core banding material must be asbestos free incombustible mineral composition.

- D. Adhesive for bonding pultrusion's shall exhibit the following minimum coupon properties (per SAE):
 - 1. Tensile Strength (D882-83A modified) minimum 2000 psi
 - 2. 8 day 25° C at 100% humidity Cross Peel (SAE J1553) minimum 330 psi
 - 3. 7 day immersion in seawater Cross Peel (SAE J1553) minimum 330 psi
 - 4. 30 day immersion in saltwater Cross Peel (SAE J1553) minimum 330 psi
 - 5. 72 hour immersion in gasoline Cross Peel (SAE J1553) minimum 330 psi
 - 6. 72 hour immersion in 20% sulfuric acid Cross Peel (SAE J1553) minimum 300 psi
- E. UL 10b, UL 10c / UBC7-2 positive pressure – Doors and Frames:
 - 1. Singles and pairs, with component listings for both FRP doors and FRP frames.
- F. UL 9, - Fixed Sash:
 - 1. Listing for Fiberglass fixed sash with FRP glazing stop.

2.5 FASTENERS

- A. All fasteners for all hardware shall be type 304 CRSS (18-8 series corrosion resistant stainless steel). No carbon steel or aluminum components shall be used.

2.6 HARDWARE

- A. Doors shall be factory mortised and drilled for mortise template butt hinges, with #12x3" long stainless steel screws for hinge attachment. Provide 161 cylindrical lock bore, rim deadbolt, ANSI 86 mortise lock edge prep and pocket or flush bolt cutouts as required.
- B. Frames shall be factory machined and drilled for all hardware requiring mortises, with #12x1-1/4" long stainless steel screws for hinge attachment.
- C. Hardware shall be furnished as listed in Section 08 71 00 or as so designated in appropriate section, and shall be coordinated by GC and installed by experienced mechanics.
- D. Supplier shall furnish manufacturer's standard templates, installation instructions, or full size approved door and frame preparation instructions as approved by the architect and as required by door and frame manufacturer prior to door and frame factory initiated manufacture. Standard factory lead-time for production of FRP doors and frames shall commence only and when all distributor required preparation information is received and acknowledged by the door and frame manufacturer.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Factory mark all doors and frames using a chemical resistant plastic tag or indelible marker with identifying number, keyed to shop drawings, prior to shipment.

3.2 INSTALLATION

- A. Frames: Install in strict accordance with manufacturer's printed instructions. Set plumb and square, using shims for bolt-in of existing openings, or wood bracing prior to grouting of jambs. Use at least two 2x6 wood spreaders inside frame to maintain critical opening dimensions during grouting.
- B. Doors: Hang per manufacturer's printed instructions using special screws provided for hinge attachment. Install doors to swing freely and to stand open at any angle. After installation make final adjustments to hardware to allow for proper door operation and latching. All surface applied hardware shall be thru bolted.

3.3 CLEANING

- A. Clean exposed surfaces of FRP doors and frames with a mild, non-abrasive cleaner and water.

END OF SECTION 08 16 13

SECTION 087100 - DOOR HARDWARE

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 this Section.

1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 081113 "Hollow Metal Doors and Frames" for hardware used with hollow metal frames.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.
 - 1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
- C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels. If automatic self-latching bolts, coordinators, and astragals are required they shall be furnished.
- D. Submit fire test data showing compliance with UBC Std. 7-2 and supplemental "S" label requirements.

1.5 PRODUCT HANDLING

- A. Tag each item, or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

PART 2 - PRODUCTS

2.1 PRODUCT HANDLING:

- A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate door number to match door numbers of approved hardware schedule.
- C. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that the count is correct.
- D. Deliver individually packaged items at the proper times to the proper locations (shop or project site) for installation.
- E. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

2.2 MANUFACTURERS:

- A. The numbers shown in the hardware groups are taken from the catalogs of the following manufacturers and are for the purpose of establishing quality, design, function and finish. Except as listed, no substitutes will be allowed, unless approved by the architect prior to bid opening. No substitutions will be allowed after bid opening. Requests for approval must be made to the architect. All substitutions must be from hardware distributors, not factory representatives.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Butts and Hinges:
 - a. Bommer Industries, Inc.
 - b. Hager Hinge Co.
 - c. Ives
 - d. McKinney Products Co.
 - e. Stanley Hardware, Div. Stanley Works.
 - 2. Locks:
 - a. Best Access Systems
 - 3. Cylinders:
 - a. Match with existing locks, verify with Owner.
 - 4. Bolts:
 - a. Ives
 - b. Rockwood Manufacturing Co.
 - c. Triangle Brass Manufacturing Company (Trimco).
 - 5. Overhead Closers, Auto Operators:
 - a. Norton, Div. Assa-Abloy
 - b. Stanley Hardware
 - 6. Door Control Devices:
 - a. Ives
 - b. Rockwood Manufacturing Co.
 - c. Triangle Brass Manufacturing Company (Trimco).
 - 7. Door Trim Units:
 - a. Ives
 - b. Rockwood Manufacturing Co.
 - c. Triangle Brass Manufacturing Company (Trimco).

8. Door Stripping and Seals:

- a. National Guard Products, Inc.
- b. Pemko Manufacturing Co., Inc.
- c. Reese Enterprises, Inc.

2.3 MATERIALS AND FABRICATION:

- A. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified standard applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designation indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
- E. Provide concealed fasteners for hardware units which are exposed when door is closed, except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.
- F. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.4 HINGES, BUTTS AND PIVOTS:

- A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template produced units.
- B. Screws: Furnish Phillips flat-head machine screws for installation of units, except furnish Phillips flat-head wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - 1. Steel Hinges: Steel pins.

2. Non-ferrous Hinges: Stainless steel pins.
 3. Out-swinging Lockable Doors: Non-removable pins.
 4. Interior Doors: Non-rising pins.
 5. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.
- D. Number of Hinges: Provide number of hinges indicated but not less than one pair of hinges for each door up to 60" in height. Furnish one each additional hinge for every additional 30" or fraction thereof.
- E. Continuous Hinges: Provide heavy duty full mortise type continuous hinges at all exterior openings and where noted in hardware sets.

2.5 LOCK CYLINDERS AND KEYING:

- A. General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.
- B. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), integrated with the existing system.
1. Match existing key cylinders for all exterior doors.
- C. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.
- D. Comply with Owner's instructions for master keying, and, except as otherwise indicated, provide individual change keys for each lock which is not designated to be keyed alike with a group of related locks. Construction Master Key all locks or provide temporary cylinders for use during the construction period.
- E. Key Material: Provide keys of nickel and silver only.
- F. Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system.
1. Deliver permanent keys to Owner or Owner's representative.

2.6 LOCKS, LATCHES AND BOLTS:

- A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware.
1. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.
- B. Lock Throw: Provide 1/2" minimum throw of latchbolts on single doors, 1" minimum throw of deadbolts. Provide 3/4" minimum throw of latchbolts on UL rated pairs of doors where required by code.

- C. Flush Bolt Heads: Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod door doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.
- D. Exit Device Dogging: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with a keyed dogging device to hold the push bar down and the latch bolt in the open position.
- E. Shim Kits: On doors with vision panels extending below the exit device mounting height, provide shim kits to space the exit device away from the door sufficient distance to clear the vision panel.

2.7 PUSH/PULL UNITS:

- A. Exposed fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for match pairs, but not for single units.

2.8 CLOSERS AND DOOR CONTROL DEVICES:

- A. Size of units. Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use. Provide parallel arms for all overhead closers except as otherwise noted. Furnish drop plates and accessories as required for project conditions.

2.9 DOOR TRIM UNITS:

- A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws or self-tapping screws.
- B. Fabricate protection plates (armor, kick or mop) not more than 2" less than door width on stop side and not more than 1/2' less than door width on pull side, x the height indicated.
 - 1. Plastic Plates: Plastic laminate (polyester), 1/8" (0.125") thick, beveled on all four edges.

2.10 WEATHERSTRIPPING:

- A. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stock maintained by manufacturer.

2.11 THRESHOLDS:

- A. General: Except as otherwise indicated provide standard metal threshold unit of type, size and profile as shown or scheduled.

2.12 HARDWARE FINISHES:

- A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units) for color and texture.
- B. Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standard, but in no case less than specified for the applicable units of hardware by referenced standards.
- D. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- E. Hardware in general to be US26D. Lock trim to be 626.
- F. Door closers to be in lacquered finish to match other hardware

2.13 HARDWARE SETS:

- A. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

HW 01 – EXTERIOR DOOR

3	EA	HINGE	BB5005-450	626	BOM
1	EA	STOREROOM LOCK	93K7D15D	626	BES
1	EA	SURFACE CLOSER	QDC115	689	STA
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	S88D	DKB	PEM
1	EA	DOOR SWEEP	315CN	AL	PEM
1	EA	THRESHOLD	171AK	AL	PEM

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Mount hardware units at heights indicated in Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and counter sink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.2 ADJUST AND CLEAN:

- A. Final Adjustment: Wherever hardware installations is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustments of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilation equipment.
- B. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finish during the final adjustment of hardware.
- C. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials, or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

END SECTION 087100

SECTION 099100 - 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, painting and finishing of exposed interior and exterior items and surfaces as defined in the Master Painters Institute (MPI) Architectural Painting Manual and the following:
 - 1. Surface preparation, priming and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
 - 2. Special Preparation and repainting of existing surfaces.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Sealants" for caulking of interior joints at or adjacent to surfaces to be painted.
 - 2. Division 8 Section, "Hollow Metal Doors and Frames" for shop-priming steel doors and frames.
- C. Paint exposed surfaces whether or not colors are designed in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
 - 1. Painting does include field-painting exposed bare and covered pipes and ducts, hangers, exposed steel and iron work and primed metal surfaces of mechanical and electrical equipment unless specifically indicated.
- D. Painting is not required on prefinished items (except as noted), finished metal surfaces, concealed surfaces, operating parts and labels.
 - 1. Prefinished items not to be painted include the following factory-finished components:
 - a. Plastic laminated architectural casework.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - d. Switchgear.
 - e. Distribution cabinets.
 - f. Prefinished toilet compartments.

2. Concealed surfaces not to be painted include wall or ceiling surfaces in inaccessible areas.
3. Finished metal surfaces not to be painted include:
 - a. Anodized aluminum
 - b. Stainless steel and Chromium plate.
 - c. Copper, bronze and brass
4. Operating parts not to be painted include moving parts of operating equipment such as the following:
 - a. Valve and damper operators
 - b. Linkages
 - c. Sensing devices
 - d. Motor and fan shafts
5. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating or nomenclature plates.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each paint system specified, including block fillers and primers.
 1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage and application of each material proposed for use.
 2. List each material and cross-reference the specific coating, finish system and application. Identify each material by the manufacturer's catalog number and general classification.
 3. Submit Material Safety Data Sheets to Owner's Representative at least two weeks before material is delivered to the site.
- C. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions on representative samples of the actual substrate.
 1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color and texture are achieved.
 2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
 3. Submit samples on the following substrates for the Architect's review of color and texture only.
 - a. Gypsum Board: Submit two 8-inch-square samples for each color and finish.
 - b. Painted Wood: Submit two 12-inch square samples of each color and material on hardboard.
 - c. Ferrous Metal: Submit two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- C. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- D. Paint Grade: 'Premium' as defined by the MPI.
- E. Employ only qualified journeymen in this painting and decorating work; apprentices may be employed on the project to work under the direction of qualified journeymen.
- F. Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality assurance Association having jurisdiction.
- G. All paint manufacturers and products used shall be as listed under the "Approved Products" section of the MPI Architectural Painting Specification Manual.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packaged and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type)
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

1.6 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperature are between 45 deg F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
- D. Do not proceed with any work under this Section unless a lighting level of a minimum of 15 candlepower per square foot is provided on the surfaces to be finished.

1.7 EXTRA STOCK

- A. For the Owner's maintenance purposes for touch up, furnish one properly filled, labeled and sealed gallon can of each type of finish coat of each color taken from the batch mix furnished for the work. Turn over to the Owner's representative at completion of the painting work. Obtain receipt to include in close-out documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the MPI Architectural Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- B. Other paint materials such as linseed oil, shellac, etc. shall be the highest quality product of an approved manufacturer listed in the MPI Architectural Painting Specification Manual and shall be compatible with other coating materials as required.
- C. All materials and paints shall be lead and mercury free and shall have low VOC content where possible.
- D. Manufacturer: Provide products according to the manufacturer and product identification listed in the Finishes Legend. Subject to conformance with requirements and properties of the products listed, products of the following manufacturers will be considered.
 - 1. Benjamin Moore & Co. (Moore)
 - 2. Columbia Paint Co. (Columbia)
 - 3. Fuller (Fuller)
 - 4. Glidden Professional (Akzonobel).
 - 5. Parker Paint Mfg. Company (Parker)

6. PPG Industries, Pittsburgh Paints (PPG)
7. Rodda Paint Co. (Rodda)
8. The Sherwin-Williams Company (S-W)
9. ICI Paint.
10. Kelly Moore Paint

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, finish coat materials and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality: Provide the manufacturer's product as specified. Paint material containers not displaying manufacturer's product identification shall not be brought to the job site.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
 1. Flat Paints and Coatings: VOC not more than 50 g/L.
 2. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
 3. Anti-Corrosive Coatings: VOC not more than 250 g/L.
 4. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
 5. Stains: VOC not more than 250 g/L.
 6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 7. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1, 2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.

2.3 COLOR SCHEDULE

- A. Where colors are identified by product names and numbers, provide perfect color match to the listed colors. "P" numbers refer to color identification in the Finishes Legend included in the Finish Schedule at the end of this Section.

2.4 GLOSS

- A. MPI Gloss and Sheen Standards are now as follows:
- | | Gloss @ 60° | Sheen @ 85° |
|---|--------------------|---------------|
| 1. Gloss Level 1: A traditional matte finish – flat | Max. 5 units | Max. 10 units |
| 2. Gloss Level 2: A high side sheen flat–‘a velvet-like’ finish | Max. 10 units | 10 – 35 units |
| 3. Gloss Level 3: A traditional ‘eggshell-like’ finish | 10 – 25 units | 10 – 35 units |
| 4. Gloss Level 4: A ‘satin-like’ finish | 20 – 35 units | Min. 35 units |
| 5. Gloss Level 5: A traditional semi-gloss | 35 – 70 units | |
| 6. Gloss Level 6: A traditional gloss | 70 – 85 units | |
| 7. Gloss Level 7: A high gloss | More than 85 units | |

2.5 PAINT SCHEDULE

- A. Exterior Surfaces: Paint exterior surfaces in accordance with the following MPI Architectural Painting Specification Manual requirements:
- Hollow Metal Door and Frame:
 - EXT 5.3J: W. B. Light Industrial Coating (over w.b. galvanized primer).
 - Existing pre-cast wall panels.
 - EXT 3.1A: Latex (over w.b. alkali-resistant primer)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
- Do not begin to apply paint until unsatisfactory conditions have been corrected.
 - Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatment, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
 - 2. Wood: Clean surfaces of dirt, oil and other foreign substances with scrapers, mineral spirits and sandpaper as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides and backsides of wood including cabinets, trim, counters, cases and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms and cutouts of primed or unprimed wood doors with a heavy coat of varnish, primer or sealer immediately upon delivery.
 - 3. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
 - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
 - 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

5. Cementitious Materials: Prepare concrete, cement plaster and reinforced concrete panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by the coating manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish coating to blister and burn, correct this condition before coating application. Do not paint surfaces where moisture content exceeds that permitted in the manufacturer's printed directions.

3.3 ADDITIONAL REQUIREMENTS FOR EXISTING SURFACES SCHEDULED FOR REPAINT

- A. General: Reference is made to the MPI Architectural Painting Specification Manual for the terminology used to describe the existing conditions. This information is not intended to permit or encourage the Bidder/Contractor to forgo site visits and inspections to determine actual conditions before the Contract is awarded.

3.4 MATERIALS PREPARATION

- A. General: Carefully mix and prepare paint materials according to manufacturer's directions.
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials or residue.
 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 3. Use only thinners approved by the paint manufacturer and only within recommended limits.
- B. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions detrimental to formation of a durable paint film.
 1. Paint surface treatments and finishes are indicated in the schedules.
 2. Provide finish coats that are compatible with primers used.

3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coats has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 4. Apply additional coats if undercoats, stains or other conditions show through final coat of paint until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles and similar components are in place. Extend coating in these areas, as required, to maintain the system integrity and provide desired protection.
 6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
 8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 9. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
 10. Paint unfinished wood cleats, underside of casework, desk tops and similar items.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray or other applicators according to the manufacturer's directions and requirements of the surface to be painted.
1. Brushes: Use brushes best suited for the material applied.
 2. Rollers: Use rollers of carpet, velvet back or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size and recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of not less than 4.0 mils for the entire system of prime and finish coats for three coat work, or 2.5 mils where two coat work is specified.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- G. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks or other surface imperfections.
- H. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- I. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not complying with specified requirements.

3.6 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.7 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing and repainting as acceptable to the Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099100

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

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 dimensional characters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: Half-size Sample of each type of dimensional character.
 - 2. Exposed Accessories: Full-size Sample of each accessory type.
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior characters, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.R.K. Ramos.
 - b. ACE Sign Systems, Inc.
 - c. ASI Sign Systems, Inc.
 - d. Cosco.
 - e. Gemini Incorporated.
 - f. Matthews International Corporation; Bronze Division.
 - g. Metal Arts.
 - h. Metallic Arts.
 - i. Southwell Company (The).
 - 2. Basis-of-Design: As indicated on Drawings.

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Bronze Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Sign Mounting Fasteners:
 - a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability and for securing fasteners.
 - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 - 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 211200 - FIRE-SUPPRESSION MANUAL DRY STANDPIPES

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. Piping materials
 - 2. Ductile-iron pipe and fittings
 - 3. Encasement for piping
 - 4. Piping joining materials
 - 5. Yard-type fire-department connection

1.3 DEFINITIONS

- A. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at maximum working pressure of 175 psig.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For fire-suppression manual dry standpipes.
 - 1. Shop drawings as required by NFPA 14 and 24. Including but not limited to:
 - a. Include plans, elevations, sections, and attachment details.
- C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Provide product submittals and shop drawings in electronic format only.
- E. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment.

F. Resubmission Requirements

1. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Clearly indicate changes on Drawings and cloud changes in the submittals.
2. Resubmit for review until review indicates no exceptions taken or make "corrections as noted".

G. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

H. Maximum of two reviews provided of complete submittal package. Arrange for additional reviews and/or early review of long-lead item(s) and bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

I. Submit shop drawings, calculations, and product data sheets as one complete stand-alone package to AHJ, Owner's insurance underwriter and Engineer

J. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, sections, and other details, drawn to scale, or BIM model, showing the items described in this Section and coordinated with all building trades.

B. Qualification Data: For Installer and professional engineer.

C. Approved Standpipe Drawings: Working plans, prepared in accordance with NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Welding certificates.

E. Fire-hydrant flow test report.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.
- B. At completion of project, provide at least one set of as-built drawings and schematics.
- C. Provide a hard copy and an electronic file (PDF format) on CD/DVD of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or Item requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
 - 1. Include copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, and certificates of warrants.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. NFPA Compliance: Comply with NFPA 14 and 24 for materials, installations, tests, flushing, and valve for fire-suppression water-service piping.
- D. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- E. Work and materials installed to conform with all local, State, Federal and other applicable laws, and regulations.
- F. Provide products which are UL listed.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- C. Protect flanges, fittings, and specialties from moisture and dirt.

- D. All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants.
- E. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

1.9 WARRANTY

- A. Provide written warranty covering the work for a period of one year from date of substantial completion in accordance with Division 00 and Division 01.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. Manual Dry-Type Standpipe System: Includes Fire Department Connections, but does not have permanent water supply. Piping is dry. Water or foam solution must be pumped into standpipes by fire department. The piping system will include a Fire Department Connection for each standpipe to each vault. Each Fire Department Connection should be labeled to clearly identify which vault is supplied.
- B. The fire department has requested a 6" manual dry-type standpipe system. Standpipe system should be located within 100 ft. of a hydrant. See mechanical drawing set for location of system.

2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14 and NFPA 24.
- B. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.
- C. Delegated Design: Design fire-suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- D. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.
 - 1. Minimum residual pressure at each hose-connection outlet is as follows:
 - a. Outlet Size: NPS 6
 - b. Outlet Pressure: 100 psig or a pressure acceptable by State, County, and City authorities.

- E. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL for their intended fire protection function or have adequate approval or be acceptable by State, County, and City authorities.

2.3 SOURCE LIMITATIONS

- A. Obtain like items from single manufacturer.

2.4 PIPING MATERIALS

- A. Comply with requirements in Part 3 "Piping Schedule" Article for applications of pipe, tube, and fitting materials and for joining methods for specific services, service locations, and pipe sizes.

2.5 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.
- B. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.6 ENCASEMENT FOR PIPING

- A. Standard: ASTM A674 or AWWA C105.
- B. Material: Linear low-density PE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

2.7 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.
 - 1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
 - 2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1 carbon steel unless otherwise indicated.

- C. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.8 YARD-TYPE FIRE-DEPARTMENT CONNECTION

A. Description:

- 1. Standard: UL 405.
- 2. Type: Exposed, freestanding.
- 3. Pressure Rating: 175 psig
- 4. Body Material: Corrosion-resistant metal.
- 5. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
- 6. Caps: Brass, lugged type, with gasket and chain.
- 7. Escutcheon Plate: Round, brass, floor type.
- 8. Outlet: Bottom, with pipe threads.
- 9. Number of Inlets: Two per standpipe
- 10. Sleeve: Brass
- 11. Sleeve Height: 18 inches (460 mm).
- 12. Escutcheon Plate Marking: Similar to " STANDPIPE for Vault X."
- 13. Finish: Rough brass or bronze or Rough chrome plated.
- 14. Outlet Size: NPS 6.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.2 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fire-department connections.
- B. Examine roughing-in for fire-suppression standpipe system to verify actual locations of piping connections before fire-department connection installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FIRE DEPARTMENT Connection INSTALLATION

- A. Install yard-type fire-department connections in concrete slab support. Comply with requirements for concrete in Section 033000 "Cast-in-Place Concrete."

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 14 and NFPA 24 for installation of fire-suppression underground standpipe piping.
- C. Drain dry-type standpipe system piping.
- D. Install encasement for piping according to ASTM A674 or AWWA C105.
- E. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- F. Pressurize and check dry-type standpipe system piping.
- G. Install sleeves for piping penetrations of walls, ceilings, and floors.
- H. Install sleeve seals for piping penetrations of concrete walls and slabs.
- I. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.
- B. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- C. Ream ends of tubes and remove burrs.
- D. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.
- E. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
- F. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.

- G. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.
- H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.
- I. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D2774 or ASTM D3139.
- J. Fiberglass Piping Bonded Joints: Use adhesive and procedure recommended by piping manufacturer.
- K. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.
- L. Do not use flanges or unions for underground piping.

3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Heat-fused joints.
 - 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
 - 3. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping in accordance with NFPA 14 and NFPA 24 requirements.
- B. Install permanent identification signs indicating the vault that is being supplied by each fire department connection.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Flush, test, and inspect standpipe systems in accordance with NFPA 14 and NFPA 24, "System Acceptance" chapter.
 - 2. Verify that equipment hose threads are same as local fire-department equipment.
 - 3. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.
 - a. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to zero psig (zero kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 CLEANING

- A. Confirm Demonstration requirements in Division 00, and Division 01.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.
- C. Clean and disinfect fire-suppression water-service piping as follows:
- D. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
- E. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
- F. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - 1. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow it to stand for 24 hours.
 - 2. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow it to stand for three hours.

3. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- G. Prepare reports of purging and disinfecting activities.

3.10 PIPING SCHEDULE

- A. Fire Department Connection and Exposed Piping: Corrosion-resistant material.
- B. Underground fire-suppression water-service piping NPS 6 shall be one of the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern fittings; glands, gaskets, and bolts; and gasketed joints.

END OF SECTION 211200

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

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 sanitary drainage piping specialties:
 - 1. Channel (Trench) drainage systems.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. HDPE: High-density polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PP: Polypropylene plastic.
- E. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
 - 1. Trench Drain Systems, sloped invert.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

- A. Coordinate size and location of drains.

PART 2 - PRODUCTS

2.1 PIPING SCHEDULE

- A. Underground, soil, waste, and vent piping shall be one of the following:
 - 1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
 - 2. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.

2.2 CAST IRON SANITARY WASTE AND VENT PIPING

- A. Standard of Quality: All cast iron sanitary, waste and vent piping shall bear the marking of Cast Iron Soil Pipe trademark, and shall be manufactured in the United States. All the above products shall be listed with IAPMO under file numbers:
 - 1. No. 2862 Couplings
 - 2. No. 3209 Closet Bends
 - 3. No. 3270 Cast Iron Soil Pipe and Fittings - No Hub and Service Weight.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
 - 1. Gaskets: ASTM C 564, rubber.
 - 2. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Heavy-Duty, Hubless-Piping Couplings:
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ANACO-Husky.
 - 2. Clamp-All Corp.
 - 3. MIFAB, Inc.
 - 4. Tyler Pipe.
- C. Standards: ASTM C 1277 and ASTM C 1540.

- D. Description: Type 304 stainless steel full shielded couplings having 2 stainless steel bands and tightening clamps for pipe sizes 1-1/2" through 4" and 4 stainless steel bands and tightening clamps for pipe sizes 5" through 10", and 6 stainless steel bands and tightening clamps for pipe sizes 12" through 15"; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 CHANNEL (TRENCH) DRAINAGE SYSTEMS

A. Polymer-Concrete Trench Drain Systems:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ACO Drain PowerDrain – S100K Iron Edged Channels or a comparable product by one of the following:
 - a. ACO Polymer Products, Inc.
 - b. ABT, Inc.
 - c. Forte Composites, Inc.
 - d. Josam Company; Mea-Josam Div.
 - e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - f. Strongwell Corporation; Lenoir City Division.
2. Type: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - a. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
 - 1) Dimensions: 4-inch inside width. Include number of units required to form total lengths indicated.
 - 2) Frame: Gray-iron or galvanized steel for grates.
 - b. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections. Certified to EN 1433 Load Class F - 200,000 lbs. - 4,182 psi.
 - 1) Material: Ductile iron ASTM A 536-84 - Grade 304 65-45-12
 - 2) Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
 - c. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - d. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.
- C. General: Comply with all local code and Uniform Plumbing Code requirements for the installation of building drainage and vent piping unless otherwise indicated.
- D. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 230550 - IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

1.2 SUBMITTALS

- A. Product Data: Submit for each type of product indicated.
- B. Valve numbering scheme.
- C. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 degree F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Locate pipe labels on exterior of dedicated fire rated chases and shafts using same label appearance as pipe labels but adhered to chase spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of limited visibility or congested piping and equipment.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

3.5 COMMISSIONING

- A. Notify the Commissioning Agent one week prior to start up of equipment.
- B. Submit to the Commissioning Agent a Verification of Completion form with the pre-functional check off sheet for each component when it is ready for functional testing.
- C. Assist the Commissioning Agent as required to perform the functional testing on the system components and the system as a whole.

END OF SECTION 330550

SECTION 231113 - FACILITY FUEL PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Facility fuel piping supply and installation of facility fuel piping shall be by the same subcontractor as Section 231327 – “Facility Aboveground Fuel Storage Tanks”.

1.2 SUMMARY

- A. Performance:
 - 1. Facility Diesel Fuel Distribution System components shall be supplied by a single supplier with five years or more experience in commercial or industrial motor vehicle fuel systems as a primary line of business.
 - 2. Facility Diesel Fuel Distribution System components shall be supplied by the same supplier as the UST, Fuel pumps, and UST accessories as required in specification Section 231327 “Facility Aboveground Fuel Storage Tanks”.
 - 3. Facility Fuel Piping components shall form a complete system between the UST and Dispenser. The system performance shall meet the applicable codes of the City of Spokane and NFPA 30 and NFPA 30A. The system control and leak detection shall interface with the existing dispensers and UST accessories or in the case that the bid additive alternate dispensers are provided systems shall be compatible and integrated with those dispensers.
- B. Section Includes:
 - 1. Diesel pipes, tubes, and fittings.
 - 2. Double-containment piping and fittings.
 - 3. Piping specialties.
 - 4. Joining materials.
 - 5. Specialty valves.
 - 6. Mechanical leak-detection valves.
 - 7. Leak detection and monitoring system.
 - 8. Labels and identification.
 - 9. Dispensers.

1.3 DEFINITIONS

- A. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

- B. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- D. AST: Above ground Storage Tank
- E. NRTL: Nationally Recognized Testing Laboratory

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and dimensions of individual components and profiles.
 - 2. Include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 3. For valves, include pressure rating, capacity, settings, and electrical connection data of selected models.
- B. Shop Drawings: For Diesel piping.
 - 1. Include plans, elevations sections, bedding, and supports for multiple pipes.
 - 2. Include details of location of anchors, alignment guides, and loops.
 - 3. Include pipe inverts, pipe slope and sump elevations.
 - 4. Scale: $\frac{1}{4}'' = 1' - 0''$.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:
 - 1. Plans and details, drawn to scale, on which Diesel piping is shown and coordinated with other installations, using input from installers of the items involved.
 - 2. Site Survey: Plans, drawn to scale, on which Diesel piping and tanks are shown and coordinated with other services and utilities.
 - 3. Conduit plans with sizes for tank gauging, leak detection, pump power and control.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For Diesel equipment and accessories to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Trained and certified by the flexible piping manufacturer. The installer shall be responsible for the piping and all accessories. Petroleum storage tanks and dispensing systems shall be a primary line of business of the installing subcontractor. The installer shall have at least five years' experience installing petroleum underground storage tanks and dispensing systems
- B. Storage Tanks: Comply with requirements of the International Fire Code, EPA, state and local authorities having jurisdiction, including recording storage tanks.
- C. A single AST vendor shall provide components and construction verification for a complete system. Including system components specified in Section 231327 "Facility Aboveground Fuel Storage Tanks".
- D. Proprietary systems shall be tested per the manufacturer's recommendations and all requirements to meet factory requirements.
- E. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- F. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- G. Pipe Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Lift and support Diesel storage tanks only at designated lifting or supporting points, as shown on Shop Drawings. Do not move or lift tanks unless empty.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store pipes and tubes with protective PE coating to avoid damaging the coating and to protect from direct sunlight.
- D. Store PE pipes and valves protected from direct sunlight.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of flexible, double-containment piping and related equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures due to defective materials or workmanship for materials including piping, dispenser sumps, water-tight sump entry boots, terminations, and other end fittings.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Diesel Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.
- C. Comply with requirements of the EPA and of state and local authorities having jurisdiction. Include recording of Diesel piping.

2.2 PERFORMANCE REQUIREMENTS

- A. Maximum Operating-Pressure Ratings: 3-psig (21-kPa) Diesel supply pressure at dispensers.

2.3 DIESEL PIPES, TUBES, AND FITTINGS

- A. See "Outdoor Piping Installation" and "Indoor Piping Installation" articles for where pipes, tubes, fittings, and joining materials are applied in various services.
- B. Steel Pipe: ASTM A 53 Grade B seamless or ERW or ASTM A106 Grade B seamless. 2" and larger Schedule 40, 1 ½" and smaller Schedule 80.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 300, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M, for butt welding.
 - 3. Unions: ASME B16.39, Class 300, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Forged-Steel Socket Weld Fittings and Unions: ASME B16.11, minimum Class 3000, ASTM A105 forged steel.
 - 5. Weld-On Branch Fittings: MSS-SP-97 and ASME B16.11, minimum Class 3000, ASTM A105 forged steel.

6. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: Asbestos free, ASME B16.20 metallic, or ASME B16.21 nonmetallic, gaskets compatible with fuel oil.
 - e. Bolts and Nuts: ASME B18.2.1, cadmium-plated steel.
7. Protective Coating for Piping in vaults and trenches: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

C. Tubing and Fittings:

1. All tubing and fittings shall be of the same manufacturer. Basis of Design Swagelok
2. Tubing Material: seamless bright annealed 316L stainless steel, 1/2"x0.049" wall thickness, 3/4" x 0.065" wall thickness, ASTM A213/A269.
3. Tubing system fittings shall have gauge spacer to verify the fitting is attached properly.
4. Fittings: Type 316 stainless steel, ASTM A213/A269, nut and double ferrule, 4,000 psi minimum pressure rating.

2.4 PIPING SPECIALTIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. EBW, Inc.
 2. Environ Products, Inc.
 3. Morrison Bros. Co.
 4. OPW.
 5. Preferred Utilities Manufacturing Corporation.
 6. Universal Valve Company.
- B. Metallic Flexible Connectors:
 1. Listed and labeled for aboveground and underground applications by an NRTL acceptable to authorities having jurisdiction.
 2. Stainless-steel bellows with woven, flexible, bronze or stainless-steel, wire-reinforcing protective jacket.
 3. Minimum Operating Pressure: 150 psig.
 4. End Connections: Socket, flanged, or threaded end to match connected piping.
 5. Maximum Length: 30 inches
 6. Swivel end, 50-psig maximum operating pressure.
 7. Factory-furnished anode for connection to cathodic protection.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 80-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig

D. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 80-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 80-mesh startup strainer and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig

F. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

2.5 FILTERS

A. Filters and Filter Heads

1. Dual 2" NPT, dual filter head, high flow.
2. Single 1" NPT filter head, high flow.
3. Aluminum body,
4. Filters shall be 10 micron, water absorbing, material for 30 gpm flow.

2.6 JOINING MATERIALS

- A. Joint Compound and Tape for Threaded Joints: Suitable for fuel oil.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.7 SPECIALTY VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EBW, Inc.
 - 2. Environ Products, Inc.
 - 3. Morrison Bros. Co.
 - 4. OPW.
 - 5. Preferred Utilities Manufacturing Corporation.
 - 6. Universal Valve Company.
- B. Pressure Relief Valves:
 - 1. Listed and labeled for Diesel service by an NRTL acceptable to authorities having jurisdiction.
 - 2. Body: Brass, bronze, or cast steel.
 - 3. Springs: Stainless steel, interchangeable.
 - 4. Seat and Seal: Nitrile rubber.
 - 5. Orifice: Stainless steel, interchangeable.
 - 6. Factory-Applied Finish: Baked enamel.
 - 7. Maximum Inlet Pressure: 150 psig.
 - 8. Relief Pressure Setting: 60 psig.
- C. Fuel Safety Valves:
 - 1. Listed and labeled for Diesel service by an NRTL acceptable to authorities having jurisdiction.
 - 2. Body: Brass, bronze, or cast steel.
 - 3. Springs: Stainless steel.
 - 4. Seat and Diaphragm: Nitrile rubber.
 - 5. Orifice: Stainless steel, interchangeable.
 - 6. Factory-Applied Finish: Baked enamel.
 - 7. Manual override port.
 - 8. Maximum Inlet Pressure: 60 psig.
 - 9. Maximum Outlet Pressure: 3 psig.

D. Emergency Shutoff Valves (Shear Valves):

1. Listed and labeled for Diesel and biofuel service by an NRTL acceptable to authorities having jurisdiction. A fusible link trips the valve closed to shut off fuel in the event of fire. If the dispenser is pulled over or dislodged by collision, the top of the valve breaks off at the integral shear groove, activating poppets and shutting off the flow of fuel supply to the dispenser.
2. Integral Test Port: 3/8" test port to allow the piping system to be air-tested without breaking any piping connections.
3. Single poppet valve.
4. Body: ASTM A 126, cast iron.
5. Disk: FPM.
6. Poppet Spring: Stainless steel.
7. Stem: Plated brass.
8. O-Ring: FPM.
9. Packing Nut: PTFE-coated brass.
10. Fusible link to close valve at 165 deg F.
11. Thermal relief to vent line pressure buildup due to fire.
12. Maximum Operating Pressure: 0.5 psig.
13. Valve to have bosses for mounting to stabilizer bars.

2.8 MECHANICAL LEAK-DETECTION VALVES

A. Listed and labeled for Diesel service by an NRTL acceptable to authorities having jurisdiction.

1. Body: ASTM A 126, cast iron.
2. O-Rings: Elastomeric compatible with fuel oil.
3. Piston and Stem Seals: PTFE.
4. Stem and Spring: Stainless steel.
5. Piston Cylinder: Burnished brass.
6. Indicated Leak Rate: Maximum 3 gph at 10 psig.
7. Leak Indication: Reduced flow.

2.9 FIRE RESISTANT PIPE WRAP

A. Provide basis of design product or equal product as approved. All materials shall be from same manufacturer or prescribed in the installation manual.

1. 3M(tm) Interam(tm) Endothermic MAT E-5A-4 for 2 hour fire rating, UL HNKJ.FP-1 system for single containment piping.
2. 3M Fire Barrier Sealant CP 25WB+,
3. 3M Fire Barrier Water Tight Sealant 3000 WT,
4. 3M Aluminum Foil Tape 425.

2.10 LEAK-DETECTION AND MONITORING SYSTEM

A. Provide dispenser sump sensors as specified in Section 231313 – “Facility Above Ground Fuel Storage Tanks.”

2.11 DISPENSERS

- A. Dispenser: Gasboy Model 9853KX single hose or double hose as indicated on drawings dispenser with pulse output, side load.
- B. Satellite Dispensers: Gasboy 9216K, single hose.
- C. Hose Reels: Reelcraft FF9600 OLPBW or approved equal.
- D. Hose Retractor: stanchion with cable and spring retraction.
- E. Nozzles: High Flow Pressure Activated 1" Truck Nozzle with green cover, Emco Wheaton Posilok Fuel Nozzle with drybreak fitting bus nozzles. Provide with swivels.
- F. Hoses: Nitrile synthetic rubber with Fluorothermoplastic barrier layer, synthetic rubber cover, Temperature Range: -40°F to 140°F. Provide with breakaway fitting and threaded ends.

2.12 ELECTRICAL

- A. Electrical conduit and conductors shall conform to Division 26 Specifications and general notes shown on the electrical drawings.

2.13 SLEEVES

- A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends. Waterstop/anchor collar ring welded all around sleeves for cast in place service. Sleeves shall be cut for wall thickness.
- B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral Waterston, unless otherwise indicated.

2.14 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.15 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.16 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- D. Ambient air temperature.

2.17 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.18 PAINTING

- A. Provide paint and coatings per Section 099100 – Painting.

2.19 PIPE STAND FABRICATION

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 1. Base: Stainless steel.
 - 2. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 3. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

- E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 1. Bases: One or more plastic.
 - 2. Vertical Members: Two or more protective-coated-steel channels.
 - 3. Horizontal Member: Protective-coated-steel channel.
 - 4. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of Diesel piping.
- B. Examine installation of fuel-burning equipment and fuel-handling and storage equipment to verify actual locations of piping connections before installing Diesel piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.3 PREPARATION

- A. Close equipment shutoff valves before turning off fuel oil to premises or piping section.
- B. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

3.4 OUTDOOR PIPING INSTALLATION

- A. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining, to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer. Review protective coating damage with Architect prior to repair.
 - 3. Replace pipe having damaged PE coating with new pipe.
- B. Install double-containment, Diesel pipe at a minimum slope of 1 percent downward toward Diesel storage tank sump.
- C. Install vent pipe at a minimum slope of 2 percent downward toward Diesel storage tank sump.

- D. Assemble and install entry boots for pipe penetrations through sump sidewalls for liquid-tight joints.
- E. Install metal pipes and tubes, fittings, valves, and flexible connectors at piping connections to UST.
- F. Install fittings for changes in direction in rigid pipe.
- G. Install system components with pressure rating equal to or greater than system operating pressure.

3.5 INDOOR PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Install piping in concealed locations unless otherwise indicated.
- D. Install piping free of sags and bends.
- E. Install fittings for changes in direction and branch connections.
- F. Comply with requirements for equipment specifications for roughing-in requirements.
- G. Prohibited Locations:
 - 1. Do not install Diesel piping in or through HVAC ducts and plenums, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - 2. Do not install Diesel piping in walls or partitions.
- H. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- I. Connect branch piping from top or side of horizontal piping.
- J. Install unions in pipes NPS 2 and smaller at final connection to each piece of equipment and elsewhere as indicated. Unions are not required on flanged devices.
- K. Do not use Diesel piping as grounding electrode.
- L. Install sleeves and sleeve seals for piping penetrations of walls, ceilings, and floors.
- M. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.6 VALVE INSTALLATION

- A. Install manual Diesel shutoff valves on branch connections to Diesel dispenser.
- B. Install valves in accessible locations.
- C. Install oil safety valves at inlet of each dispenser.
- D. Install one-piece, bronze ball valve with hose end connection at low points in Diesel piping. Comply with requirements in Section 230523 "Ball Valves for HVAC Piping."
- E. Install emergency shutoff valves (shear valves) at dispensers.

3.7 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Bevel plain ends of steel pipe.
 - 2. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tubing" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.
- G. Flared Joints: Comply with SAE J513. Tighten finger tight then use wrench according to fitting manufacturer's written instructions. Do not overtighten.

3.8 FIRE RESISTIVE WRAP

- A. Wrap and secure per manufacturer's instructions to maintain UL rating. Finish system with fire barrier sealant, fire barrier water tight sealant, and aluminum foil tape. All materials shall be from same manufacturer or as prescribed in the installation manual.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support and equipment support materials and installation requirements are specified in "maximum spacing" below are from MSS SP-69 (water service).
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1-1/4 and Smaller: Maximum span, 84 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 1/2 inch.
 - 5. NPS 3: Maximum span, 12 feet; minimum rod size, 1/2 inch.
 - 6. NPS 4: Maximum span, 13 feet; minimum rod size, 5/8 inch.
- C. Support vertical steel pipe at each floor and at spacing not greater than 15 feet.
- D. Install hangers for horizontal, drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4 and Smaller: Maximum span, 60 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1: Maximum span, 72 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/4: Maximum span, 84 inches; minimum rod size, 3/8 inch.
 - 4. NPS 1-1/2 and NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 5. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 1/2 inch.
 - 6. NPS 3: Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 7. NPS 4: Maximum span, 11 feet; minimum rod size, 5/8 inch.
- E. Lateral and Longitudinal Bracing: Locate per drawings.

3.10 LEAK-DETECTION AND MONITORING SYSTEM INSTALLATION

- A. See Section 231313 "Facility Underground Fuel Storage Tanks".

3.11 LABELING AND IDENTIFYING

- A. Nameplates, pipe identification, valve tags, and signs are specified in Section 230553 "Identification for HVAC Piping and Equipment."

- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.
 - 1. Text: In addition to identifying unit, distinguish between multiple units; inform operator of operational requirements; indicate safety and emergency precautions; and warn of hazards and improper operations.
- C. Install detectable warning tape directly above Diesel piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs. Terminate tracer wire in an accessible area, and identify as "tracer wire" for future use with plastic-laminate sign.
 - 1. Piping: Over underground Diesel distribution piping.

3.12 FIELD QUALITY CONTROL

- A. Pressure Test Piping: Pressure tests shall be as required by the manufacturer to meet warranty requirements. Steel pipe minimum hydrostatic or pneumatic test-pressures measured at highest point in system unless indicated otherwise by manufacturer:
 - 1. Perform tests as required for Factory Warranty.
 - 2. Diesel Distribution Piping: Minimum 5 psig for minimum 30 minutes.
 - 3. Diesel, Double-Containment Piping:
 - a. Carrier Pipe: Minimum 5 psig for minimum 30 minutes.
 - b. Containment Conduit: Minimum 5 psig for minimum 60minutes.
 - 4. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig.
- B. Inspect and test Diesel piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.
- C. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Bleed air from Diesel piping using manual air vents.
- F. Diesel piping and equipment will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.13 PIPING SCHEDULE

A. Aboveground Diesel piping shall be the following:

1. NPS 5/8 to NPS 1 1/2": Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.
2. NPS 2 and Larger: Steel pipe, steel fittings, and welded or flanged joints.
3. Flanges in vaults and trenches: ANSI Class 300 Raised Face.
4. Flanges indoor above grade: ANSI Class 150 Raised Face.

3.14 PAINTING

A. Paint all piping per Section 099100 – Painting.

3.15 ELECTRICAL

A. Electrical conduit and conductor installation shall conform to Division 26 Specifications and general notes shown on the electrical drawings.

3.16 DISPENSER

- A. Install dispenser over sump.
- B. Install leak detector in sump.
- C. Provide shut-off valve and safety valve (shear valve) in sump.

3.17 SHUTOFF VALVE SCHEDULE

A. Valves for aboveground distribution piping NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.

B. Distribution piping valves for pipe NPS 2-1/2 and larger shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

C. Valves in branch piping for dispenser shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.

3.18 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
 - 10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
 - 11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
 - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 - 16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
 - 17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 - 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.19 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.
- F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

END OF SECTION 231113

SECTION 231327 - FACILITY ABOVEGROUND AUTOMOTIVE FUEL STORAGE TANKS

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. Horizontal, double wall steel, Fuel ASTs.

1.3 DEFINITIONS

- A. AST: Aboveground storage tank.

1.4 GOVERNING STANDARDS

- A. U.L. 142, Underwriters Laboratories, Inc., "Steel Aboveground Tanks for Flammable and Combustible Liquids".
- B. NFPA 30, National Fire Protection Association, "Flammable and Combustible Liquids Code".
- C. NFPA 30A, National Fire Protection Association, "Code for Motor Fuel Dispensing Facilities and Repair Garages".
- D. Uniform Fire Code, International Fire Code Institute
- E. PEI/RP-200, Petroleum Equipment Institute, "Recommended Practices for Installation of Aboveground Storage Systems for Motor-Vehicle Fueling"

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and dimensions of individual components and profiles.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 3. Diesel storage tank accessories.
 - 4. Manufacturer's current installation instructions.

B. Shop Drawings:

1. Include plans, elevations, sections, and anchors, and lifting or supporting points.
2. Indicate dimensions, components, and location and size of each field connection.
3. Shop Drawing Scale: 1/4 inch per foot.
4. Demonstrate compliance with requirements and dimensions from plans.

1.6 INFORMATIONAL SUBMITTALS

- A. Site Survey: Plans, drawn to scale, on which Diesel storage tanks are shown and coordinated with other services and utilities.
- B. Qualification Data: For qualified professional engineer.
- C. Seismic Qualification Data: For ASTs, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Brazing certificates.
- E. Welding certificates.
- F. Field quality-control reports.
- G. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For Diesel equipment and accessories to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. EPA Compliance: Comply with EPA and state and local authorities having jurisdiction. Include recording of Diesel storage tanks and monitoring of tanks.
- B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Follow UL-142 standards and practices.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of Diesel storage tanks that fail in materials or workmanship within specified warranty period.

1. Storage Tanks:

- a. Failures include, but are not limited to, the following when used for storage of Diesel at temperatures not exceeding 150 deg F:

- 1) Structural failures including cracking, breakup, and collapse.
- 2) Corrosion failure including external and internal corrosion of steel tanks.

- b. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Factory-installed support attachments for AST shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and 2018 Edition of the International Building Code.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified.

2. Design Loads:

- a. Importance Factor: 1
- b. Sds: 0.318
- c. Sd1: 0.177
- d. Ss: 0.307
- e. S1: 0.112
- f. Seismic Design Category: C
- g. Site Class: D
- h. Elevation: in below grade vault.

2.2 HORIZONTAL, STEEL, DOUBLE WALL, DIESEL AST

- A. Description: UL 142, double-wall, horizontal, cylindrical, steel tank; with enclosed, secondary-containment, and interstitial space with capacity greater than tank capacity.

- B. Construction: Fabricated with welded, carbon steel; suitable for operation at atmospheric pressure and for storing Diesel with specific gravity up to 1.1 and with maintained temperature up to 150 deg F. Minimal material thickness of the tanks shall be per UL-142 requirements. Tanks shall withstand an air pressure test of 3 to 5 psi.

1. Design & Operating Pressure: Atmospheric.
2. Design & Operating Temperature: Ambient.
3. Tank to be Built & Labeled per U.L. 142.

4. Tank to Bear Manufacturers & U.L. Labels Only.
5. Appurtenances:
 - a. See drawings for additional information. Provide as required for UL-142
 - b. Manways, 24" minimum diameter. Manways shall conform to Underwriters Laboratories 142 standard with regard to construction, bolting and gaskets.
 - c. Pump mounting plate
 - d. Vent
 - e. High level alarm
 - f. Fill connection with truck fitting and spill bucket, and overfill prevention. Fill shall have dip tube within three inches of tank bottom and strike plate under dip tube.
 - g. Top mounted water draw connection with dip tube.
 - h. Sounding and Gage Tubes: Extension of fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.
 - i. Lifting Lugs: For handling and installation.
 - j. Emergency vents for inner tank and interstitial space.
 - k. Interstitial leak detection access.
 - l. Tanks will be installed in concrete vaults. Provide tank top platform and guardrails for maintenance access. Guardrails shall be sufficient to support (3) 3" Diesel pipes, conduits for pumps and control, and (3) 3" vent pipes. Project drawings show location and size of guardrails required to fit inside vaults. Platform is to be supported on the tank top.
6. All Fittings to be Protected for Shipment.

C. Painting and Coating:

1. Apply manufacturer's standard prime coat to exterior steel surface of AST. The interior shall not be coated.
2. Shop Cleaning: After fabrication, blast clean according to SSPC-SP 6/NACE No. 3.
3. After cleaning, remove dust or residue from cleaned surfaces.
4. If surface develops rust before prime coat is applied, repeat surface preparation.
5. Apply manufacturer's standard prime coat to shop-cleaned, dry surface same day as surface preparation.
6. Apply manufacturer's standard two-component, epoxy finish coats.

- D. Supports: Manufacturer's standard structural steel welded to tank and sufficient to be installed on concrete floor. Provide means for anchoring tank if it will not stay in position by gravity. Design of the steel supports shall be per approved UL listing and be able to support the weight of the tank filled to capacity. Maximum height of saddle when measured from lowest portion of the tank shell to grade level shall be no more than 12 inches high.

- E. Capacities and Characteristics: see drawings.

- F. Fuel Grade: Diesel No. 2 and Biodiesel.

2.3 LIQUID-LEVEL GAGE SYSTEM

- A. Description: Calibrated liquid-level gage system complying with UL 180 with floats other sensors and remote annunciator panel.

- B. Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms; fuel indicator with registration in gallons; and overfill alarm. Include gage volume range that covers Diesel storage capacity.
- C. Controls: Electrical, operating on 120-V ac.

2.4 LEAK-DETECTION AND MONITORING SYSTEM

- A. Cable and Sensor System: Comply with UL 1238.
 - 1. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for Diesel storage tanks and Diesel piping.
 - 2. Include fittings and devices required for testing.
 - 3. Controls: Electrical, operating on 120-V ac.
 - 4. Calibrated liquid-level gage complying with UL 180 with floats or other sensors and remote annunciator panel.
 - 5. Remote Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms; fuel indicator with registration in gallons; and overfill alarm. Include gage volume range that covers Diesel storage capacity.
 - 6. Controls: Electrical, operating on 120-V ac.

2.5 SOURCE QUALITY CONTROL

- A. Pressure test and inspect Diesel storage tanks, after fabrication and before shipment, according to ASME and the following:
 - 1. Double-Wall Steel ASTs: UL 142, STI F921, and STI R931.
- B. Affix standards organization's code stamp. Each tank shall bear the U.L. listing mark for, "Secondary Containment Aboveground Tank for Flammable Liquids".
- C. Air test at not less than 3 psi nor more than 5 psi. Primary tank to be tested alone. Secondary tank to be pressure tested with pressure in primary tank. This shall be accomplished by bleeding air from the primary tank into the secondary tank. At no time shall the pressure in the secondary tank exceed the pressure in the primary tank. Tank to be examined with water & soap suds solution

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for aboveground Diesel storage tanks to verify actual locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DIESEL AST INSTALLATION

- A. Install tank bases and supports.
- B. Concrete Bases: Level and grout tank supports. Anchor AST to concrete floor. Calculate anchors to resist seismic forces.
- C. Connect piping and vent fittings.
- D. Install ground connections.
- E. Install tank leak-detection and monitoring devices.
- F. Install steel ASTs according to STI R912.
- G. Install insulated and concrete-vaulted, steel ASTs according to STI R942.
- H. Fill storage tanks with Diesel.

3.3 LIQUID-LEVEL GAGE SYSTEM INSTALLATION

- A. Install liquid-level gage system.

3.4 LEAK-DETECTION AND MONITORING SYSTEM INSTALLATION

- A. Install leak-detection and monitoring system. Install alarm panel inside building where indicated.
 - 1. Double-Wall, Diesel Storage Tanks: Install probes or use factory-installed integral probes in interstitial space.
 - 2. Single-Wall, Diesel Storage Tanks: Install probes as indicated.
 - 3. Double-Containment, Diesel Piping: Install leak-detection sensor probes in Diesel storage tank containment.
 - 4. Install liquid-level gage.

3.5 LABELING AND IDENTIFYING

- A. Nameplates: indicate contents in 3" high black lettering on tank sidewall.

3.6 FIELD PAINTING OF AST

- A. Prepare and touch up damaged exterior surface of AST as specified in "Shop Painting of AST" Article.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
 - 1. Tanks: Minimum hydrostatic or compressed-air test pressures for Diesel storage tanks that have not been factory tested and do not bear the ASME code stamp or a listing mark acceptable to authorities having jurisdiction:
 - a. Inner Tanks: Minimum 3 psig and maximum 5 psig.
 - b. Interstitial Space: Minimum 3 psig and maximum 5 psig, or 5.3-in. Hg vacuum.
 - c. Where vertical height of fill and vent pipes is such that the static head imposed on the bottom of the tank is greater than 10 psig, hydrostatically test the tank and fill and vent pipes to a pressure equal to the static head thus imposed.
 - d. Maintain the test pressure for one hour.
- C. ASTs will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 231323

SECTION 233116 - NONMETAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset FRP Ducts And Fittings

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including duct closure, reinforcements, and hangers and supports, shall comply with SMACNA's "Fibrous Glass Duct Construction Standards" and performance requirements and design criteria indicated.
 - 1. Static-Pressure Classes:
 - a. Supply Ducts: 2-inch wg.
 - b. Exhaust Ducts (Negative Pressure): 2-inch wg.

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Fibrous-glass duct materials.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes and pressure classes.
 - 3. Elevation of top of ducts.
 - 4. Dimensions of main duct runs from building grid lines.
 - 5. Fittings.
 - 6. Reinforcement and spacing.
 - 7. Seam and joint construction.
 - 8. Penetrations through fire-rated and other partitions.
 - 9. Equipment installation based on equipment being used on Project.
 - 10. Hangers and supports.

- C. Delegated-Design Submittal:
 - 1. Duct materials and thicknesses.
 - 2. Joint and seam construction and sealing.
 - 3. Reinforcement details and spacing.
 - 4. Below grade sleeper supports and rock shields.
- D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 - 2. Structural members to which duct will be attached.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. NFPA Compliance:
 - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. NBS PS-15-69 - Custom Contact-Molded Reinforced-Polyester Chemical-Resistant Process Equipment.

PART 2 - PRODUCTS

2.1 THERMOSET FRP DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Spunstrand Inc.
 - 2. Perry Fiberglass Products, Inc.
 - 3. McGill AirFlow LLC.
- B. Duct and Fittings:
 - 1. Thermoset FRP Resin: Manufacture duct with resin that complies with UL 181, Class 1, maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL according to ASTM E 84.
 - 2. Inner Liner: FSK liner rated by an NRTL to comply with UL 181, Class 1.
 - 3. Round Duct: ASTM D 2996, Type I, Grade 2, Class E, filament-wound duct, minimum 0.125-inch wall thickness, with tapered bell and spigot ends for adhesive joints, or plain ends with couplings.

4. Round Fittings: Compression or spray-up/contact, molded of same material, pressure class, and joining method as duct.
- C. Joining Materials: Roving and polyester resin.
- D. Fabrication:
 1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, and access doors and panels according to SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."
 2. Fabricate 90-degree rectangular mitered elbows to include turning vanes, 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- E. Drains: Formed drain pockets with a minimum of NPS 1 threaded pipe connections.

2.2 DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Spunstrand Inc.
 2. Ruskin
 3. Perry Fiberglass Products, Inc.
 4. McGill AirFlow LLC.
- B. Dampers shall be flanged fiberglass construction.
 1. Frame: Fiberglass channel, vinyl ester resin with 100 mils of translucent corrosion liner as minimum with blade stop.
 2. Flanges: Comply with NBS PS-15-69.
 - a. Width and Thickness: Comply with NBS PS-15-69, Table 2.
 3. Blade: Fiberglass, vinyl ester resin. Center pivoted. Complete with composite coring or Balsa to meet or exceed 1/360 deflection centered in laminate.
 4. Axle: fiberglass rod, vinyl ester resin, or Type 316 stainless steel bolted to shaft.
 5. Control Shaft: : Axle extends 6 inches beyond frame.
 6. Bearings: Molded PTFE with 10% carbon and graphite fill.
- C. Performance for Dampers Diameters from 12 to 66 inches:
 1. Maximum System Pressure: 30 inches wg.
 2. Maximum System Velocity: 6,000 feet per minute.
 3. Leakage without Seals: Based on pressure differential of 1 inch wg.
 - a. Percent of Maximum Flow: 0.16.
 - b. Total Leakage: 275 cubic feet per minute (7.8 m3/min).

2.3 CENTRIFUGAL VENTILATORS - ROOF UPBLAST

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck
 - 2. Loren Cook
 - 3. Twin City Fan
- B. Centrifugal roof upblast ventilator, direct drive. Performance as scheduled on drawings.
- C. Housing: Removable spun-aluminum dome top and outlet baffle; square, one-piece aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
- D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades; spark-resistant construction classified in accordance with AMCA 99, Section 8, Type C.
- E. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

2.4 SLEEVES

- A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends. Waterstop/anchor collar ring welded all around sleeves for cast in place service. Sleeves shall be cut for wall thickness.
- B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.5 SUPPORTS

- A. Concrete Curbs and Underground Sleepers: See Section 033000 - Cast in Place Concrete and details on structural drawings.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-2, "Minimum Hanger Sizes for Round Duct."
- C. Duct Attachments: Use clamping devices.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Install ducts with fewest possible joints.

- B. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- C. Install ducts with a clearance of 1 inch.
- D. Where ducts pass through concrete use sleeves cast in place and link type seals. Finish opening with grout. Coordinate sleeve locations with general contractor.
- E. Install thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual."

3.2 HANGER AND SUPPORT INSTALLATION

- A. Install hangers and supports for thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used. Do not attach to precast vault covers.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
 - a. Underground duct shall be watertight.
 - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

END OF SECTION 233116

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

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. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 3. To allow right of way for piping and conduit installed at required slope.
 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by, or equivalents to, Cooper Industries.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Link-Seal Devices manufactured by Cooper Industries, or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 3. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 4. Pressure Plates: Steel with zinc dichromate plate. Include two for each sealing element.
 - 5. Connecting Bolts and Nuts: Carbon steel with zinc dichromate of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

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

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 260533 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom enclosures and cabinets.
 - 2. For handholes and boxes for underground wiring, including the following:
 - a. Duct entry provisions, including locations and duct sizes.
 - b. Frame and cover design.
 - c. Grounding details.
 - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
 - e. Joint details.
- C. Samples for Initial Selection: For **[wireways]** **[nonmetallic wireways]** **[and]** **[surface raceways]** with factory-applied texture and color finishes.
 - 1. Size: **<Insert sample size.>**
- D. Samples for Verification: For each type of exposed finish required for **[wireways]** **[nonmetallic wireways]** **[and]** **[surface raceways]**, prepared on Samples of size indicated below.
 - 1. Size: **<Insert sample size.>**
- E. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members in the paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- F. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified **[and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event].**"
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Qualification Data: For professional engineer and testing agency.
- H. Source quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 5. Electri-Flex Co.
 - 6. Manhattan/CDT/Cole-Flex.
 - 7. Maverick Tube Corporation.
 - 8. O-Z Gedney; a unit of General Signal.
 - 9. Wheatland Tube Company.
- C. Rigid Steel Conduit: ANSI C80.1.
- D. Aluminum Rigid Conduit: ANSI C80.5.
- E. IMC: ANSI C80.6.
- F. PVC-Coated Steel Conduit: PVC-coated [**rigid steel conduit**] [**IMC**].
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- G. EMT: ANSI C80.3.
- H. FMC: Zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.

2. Fittings for EMT: Steel or die-cast, set-screw type.
 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- K. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arnco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.; Pipe & Plastics Group.
 6. Condux International, Inc.
 7. ElecSYS, Inc.
 8. Electri-Flex Co.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Manhattan/CDT/Cole-Flex.
 11. RACO; a Hubbell Company.
 12. Thomas & Betts Corporation.
- C. ENT: NEMA TC 13.
- D. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- E. LFNC: UL 1660.
- F. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arnco Corporation.
 2. Endot Industries Inc.

3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.

C. Description: Comply with UL 2024; flexible type, approved for general-use installation.

2.4 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
 2. Hoffman.
 3. Square D; Schneider Electric.
- C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 12, unless otherwise indicated.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: Screw-cover type.
- F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hoffman.
 2. Lamson & Sessions; Carlon Electrical Products.
- C. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- D. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- E. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.6 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Prime coating, ready for field painting.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Butler Manufacturing Company; Walker Division.
 - b. Enduro Systems, Inc.; Composite Products Division.
 - c. Hubbell Incorporated; Wiring Device-Kellems Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.

2.7 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Erickson Electrical Equipment Company.
 - 4. Hoffman.
 - 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 6. O-Z/Gedney; a unit of General Signal.
 - 7. RACO; a Hubbell Company.
 - 8. Robroy Industries, Inc.; Enclosure Division.
 - 9. Scott Fetzer Co.; Adalet Division.
 - 10. Spring City Electrical Manufacturing Company.
 - 11. Thomas & Betts Corporation.

12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- C. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- D. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- F. Metal Floor Boxes: Sheet metal, rectangular.
- G. Nonmetallic Floor Boxes: Nonadjustable, round.
- H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- I. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, with gasketed cover.
- J. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- K. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
1. Color of Frame and Cover: Gray.
 2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, as indicated for each service.
 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Handholes: 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation.
 - d. NewBasis.
- C. Fiberglass Handholes and Boxes with Polymer-Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester-resin enclosure joined to polymer-concrete top ring or frame.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. Christy Concrete Products.
 - d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.
- D. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of cast iron.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Carson Industries LLC.
 - b. Christy Concrete Products.
 - c. Nordic Fiberglass, Inc.

2.9 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.10 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex Co.
 - 4. Pipeline Seal and Insulator, Inc.
- D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.11 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by an independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-80 PVC, direct buried.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 12.
5. Application of Handholes and Boxes for Underground Wiring:
 - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
 - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
9. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

- C. Minimum Raceway Size: [1/2-inch (16-mm)] [3/4-inch (21-mm)] trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
 - 1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
 - 2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
 - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C).
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C).
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C).
 - d. Attics: 135 deg F (75 deg C).
 - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
 - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

- O. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- Q. Set metal floor boxes level and flush with finished floor surface.
- R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

- 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
- 2. Install backfill as specified in Division 31 Section "Earth Moving."
- 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
- 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
- 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
- 6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below the frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
 - 1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.8 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 265100 – INTERIOR LIGHTING

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 DEFINITIONS

- A. BF: Ballast factor
- B. CRI: Color-rendering index
- C. LED: Light Emitting Diode
- D. LER: Luminaire efficacy rating
- E. Luminaire: Complete lighting luminaire, including lamp and ballast

1.3 SUBMITTALS

- A. Product Data: Submit for each type of luminaire, arranged in order of luminaire designation.
- B. Special Submittals: Provide special submittals as specified on the Luminaire Schedule.
- C. Lamp Data: Provide a list which gives the lamp part number for each luminaire type.
- D. Ballast Data: Provide a list which gives the ballast part number for each luminaire type.

1.4 COORDINATION

- A. Verify and coordinate the various ceiling system with the light luminaire frame requirements. Provide the proper frame for each luminaire. luminaires installed in non-accessible ceilings shall be provided with a plastic flange.
- B. Verify the voltage of each luminaire. Provide the proper ballast voltage for each luminaire.
- C. The luminaire type symbols indicated on the drawings are intended to show the type of luminaire in that particular room or general area. Each individual lighting luminaire shown on the drawings does not necessarily have a luminaire type symbol shown adjacent to it. If a luminaire type symbol is missing from a particular room or area, the Contractor shall assume, for purpose of bidding only, that the luminaire type is **HF.A1**.

1.5 WARRANTY

- A. Special Warranty: Provide manufacturer's five-year lamp and ballast combination warranty – refer to Osram-Sylvania warranty.

1.6 COMMISSIONING

- A. Notify the Commissioning Agent one week prior to start up or testing of equipment. Refer to 019113 for a list of commissioning activities.
- B. Assist the Commissioning Agent as required to perform the functional testing on the system components and the system as a whole.

PART 2 – PRODUCTS

2.1 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires Accessories: Provide frames, hangers, spacers, stems, aligner canopies, auxiliary junction boxes and all other hardware as required for a complete installation.
- B. UL Labels: Provide UL labels on all luminaires. Luminaires installed in damp or wet locations in interior or exterior areas shall be UL labeled as "Suitable for damp locations," or "Suitable for wet locations." Surface-mounted luminaires shall be UL labeled for direct surface mounting.
- C. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.
- D. All luminaire hardware and latches shall be steel. Plastic type clips and latches are not allowed.
- E. Fire-Rated Enclosures
 - 1. The Electrical Contractor shall provide 5/8" plasterboard minimum, taped box enclosures for all recessed luminaires in 1- or 2-hour fire-rated ceilings, as required by local building or fire codes. Enclosure to provide minimum 3" air space around luminaire. Electrical Contractor to verify with the Architect areas where this provision is applicable.
- F. Luminaire Support
 - 1. Hangers for Pendant Industrial Luminaires: Luminaires shall be pendant mounted with rigid stems and swivel canopy unless otherwise specified. Provide seismic restraint wires to adjacent structure to prevent horizontal movement.

2. Safety Hangers: Provide four No. 12 gauge slack wire safety hangers on diagonal corners of each recessed or surface mounted fluorescent luminaire installed on this project. Secure wires to structure above, independent of ceiling system.

G. Luminaire Accessories

1. Luminaire Lenses: All plastic luminaire lenses are to be pattern 12, minimum 1/8-inch thick, and 100 percent virgin acrylic plastic unless specified otherwise. Manufacture: KSH Plastics or approved equal.
2. Luminaire Hanging and Mounting Accessories: The Electrical Contractor shall provide all necessary hanging or mounting devices for all luminaires and shall be responsible for checking the type needed for various ceiling conditions. Plaster rings shall be provided where required.
3. Prewired Splice Boxes: Prewired splice boxes for recessed incandescent or compact fluorescent luminaires shall be 4-inch square or equivalent with a minimum of four 1/2-inch knockouts and shall comply with code-required size for branch circuit wiring.
4. Pre-manufactured Luminaire Whips: Luminaire whips assembled at the factory may be used to connect recessed light luminaires in accessible ceilings.

H. Proper Lighting Luminaire Types

1. Before ordering lighting luminaires, the Electrical Contractor shall be responsible for verifying and coordinating the ceiling systems and lighting luminaire frame requirements as well as the proper ballast voltage.
2. All luminaire hinged doors to have beveled aluminum frame with regressed lens design unless specified otherwise.
3. Provide 6'0" long x 3/8-inch flexible conduit pigtail and outlet box for each luminaire where installed in accessible suspended ceilings.
4. The luminaire type symbols indicated on the drawings are intended to show the type of luminaire in that particular room or general area. Each individual lighting luminaire shown on the drawings does not necessarily have a luminaire type symbol shown adjacent to it.

I. Trademark or Monograms

1. There shall be no visible trademarks or monograms on the lighting luminaires.

J. Luminaire Continuity

1. All luminaires of the same general category (i.e., 1x2's, 1x4's, 2x2's, 2x4's, 4x4's) shall be of same manufacture and series to ensure that all lenses and trims match and are compatible in appearance.

K. Locking Clips

1. Electrical Contractor is to provide and install four locking clips per luminaire for all fluorescent luminaires installed into exposed T-bar ceiling suspension systems. The locking clip is to be attached to the luminaire with a sheet metal screw or similar and secured to the main or supporting T-bar runner to guarantee a secure installation.

L. Surface Mounted Luminaires

1. Provide surface mounted fluorescent luminaires with UL approval for direct mounting on the various ceilings used. Spacers will not be approved. Where mounted on lay-in ceilings, support luminaires by at least two positive devices which surround the ceiling runner, and which are supported from the structure above by a No. 12 gauge wire. Spring clips or clamps that connect only to the runner are not acceptable.

2.2 LED LUMINAIRES

- A. LED Luminaires shall be in accordance with IES, NFPA, UL, as shown on drawings, and as specified. Where conflicts occur, the most expensive option shall govern, no exceptions.
- B. LED Luminaires shall be Reduction of Hazardous Substance (ROHS) – compliant.
- C. LED Modules shall include the following features unless otherwise indicated:
 1. Comply with IES LM-79, LM-80, and LM-82 requirements
 2. Color Rendering Index and Color Temperature as specified in Luminaire Schedule.
 3. Minimum rated life: 50,000+ hours per IES L70 definition or as specified in Luminaire Schedule.
 4. Light Output Lumens as specified in Luminaire Schedule.
- D. LED Luminaires: LED drivers, modules, housings, and reflector shall be accessible, serviceable, and replaceable; Housing, LED driver, and LED module shall be products of the same manufacturer (OEM).
- E. LED lamps/arrays shall have consistent color temperature (tight binning), a high Color Rendering Index (85+ CRI), and a rated life greater than 50,000 hours.

2.3 DRIVERS FOR LED LUMINAIRES

- A. LED Drivers: Operation to be at standard rated voltage of driver, not “over-driven”. Comply with UL 1598 and 8750. Test according to IES LM-79 and LM-80.
 1. Minimum efficiency: 85% at full load.
 2. Minimum operation Ambient Temperature: - 20 degrees C (- 4 degrees F)
 3. Input Voltage: 120 – 277 V (+/- 10%) at 60 Hz
 4. Integral short circuit, open circuit, and overload protection
 5. Power Factor: >95%
 6. Total Harmonic Distortion: < 20%
 7. Comply with FCC 47 CFR Part 15

2.4 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- A. Manufacturer: Sylvania
 1. T8 Lamps: Quicktronic Prostart PSX series with universal voltage.

2. T5HO Lamps: Quicktronic Prostart T5HO universal, high-ambient temperature with universal voltage.
- B. Electronic Ballasts: Comply with ANSI C82.11; programmed-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
1. Sound Rating: A.
 2. Total Harmonic Distortion Rating: Less than 10 percent.
 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 4. Operating Frequency: 42 kHz or higher.
 5. Lamp Current Crest Factor: 1.7 or less.
 6. BF: 0.88 or higher.
 7. Power Factor: 0.98 or higher.
 8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
- C. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following unless otherwise indicated:
1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: A.
 4. Total Harmonic Distortion Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41, Category A or better.
 6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher, unless otherwise indicated.
 9. Power Factor: 0.98 or higher.
- D. Ballasts for Low-Temperature Environments (exterior luminaires whether indicated or not): Temperatures 0 degree F and higher; electronic or electromagnetic type rated for 0 degree F starting and operating temperature with indicated lamp types. Manufacturer Bodine.
- E. Ballasts for Dimmer-Controlled Lighting Luminaires: Electronic type.
1. Dimming Range: 100 to one percent of rated lamp lumens.
 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

2.5 GENERATOR TRANSFER DEVICE

- A. Manufacturer: Bodine

B. Operation

1. The GTD generator transfer device senses the loss of normal power and switches the AC ballast or driver input power connection to an unswitched, generator (or central inverter) supplied lighting circuit. No routine maintenance is required to keep GTD functional; however, like other life safety unit equipment, it should be checked periodically to ensure that it is working properly.

C. UL Listed

1. The GTD has been tested by Underwriters Laboratories in accordance with the standards set forth in UL 924, "Emergency Lighting and Power Equipment," and is UL listed for factory or field installation.

D. Specification

1. Generator (or central inverter) supplied egress lighting shall be provided by using a standard fluorescent or LED luminaire equipped with a Phillips Bodine GTD generator transfer device. The device shall be capable of bypassing the wall switch when the auxiliary generator (or central inverter) powers lighting. The device shall consist of relay switching circuitry and fusing contained in one 8' x 1.18' x 1.18' galvanized steel case, shall operate at 120 or 277 VAC, 60 Hz, shall have all inputs fused to 3 A maximum, shall draw 280 mA and 1.6 watts during normal operation; and shall comply with the current NEC. The device shall be UL listed for installation inside, on top of or remote from the luminaire and shall be warranted for a full five years from date of purchase.

E. Warranty

1. The GTD generator transfer device is warranted for five (5) full years from date of purchase. This warranty covers only properly installed generator transfer device used under normal conditions. For the warranty period, Phillips Emergency Lighting will, as its option, repair or replace without charge a defective device, provided it is returned to the factory transportation prepaid and our inspection determines it to be defective under terms of the warranty. Repair or replacement, as stated above, shall constitute the purchaser's exclusive warranty, which does not extend to transportation, installation, labor or any other charges; nor does it apply to any equipment of another manufacturer used in conjunction with the device.

F. Installation

1. The GTD generator transfer device does not affect normal luminaire operation and comes fully assembled to mount inside, on top of or remote from the luminaire ballast.
2. In addition to available wiring, the device requires a direct, unswitched connection to a generator (or central inverter) supplied emergency panel and an unswitched source on the same branch circuit as the switched supply.

2.6 FLUORESCENT LAMPS

A. Manufacturer: Sylvania

- B. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- C. T8 rapid-start low-mercury lamps, rated 32W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500K, and average rated life 20,000 hours, unless otherwise indicated.
- D. T8 rapid-start low-mercury lamps, rated 17W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500K, and average rated life of 20,000 hours, unless otherwise indicated.
- E. T5 rapid-start low-mercury lamps, rated 28W maximum, nominal length of 45.2 inches (1150 mm), 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000K, and average rated life of 20,000 hours, unless otherwise indicated.
- F. T5HO rapid-start, high-output low-mercury lamps, rated 54W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100K, and average rated life of 20,000 hours, unless otherwise indicated.

2.7 LIGHTING LUMINAIRE SUPPORT COMPONENTS

- A. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

2.8 EXIT SIGNS

- A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
 - 1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install lamps in each luminaire.
- B. Set luminaires level, plumb, and square with ceilings and walls.
- C. Support for Luminaires in or on Grid-Type Suspended Ceilings: Use grid as a support element.
 - 1. Install a minimum of four ceiling support system rods or wires for each luminaires. Locate not more than six inches from lighting luminaire corners.
 - 2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
 - 3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on luminaires. Wire or rod shall have breaking strength of the weight of luminaire at a safety factor of 3.

D. Suspended Lighting Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Continuous Rows: Use tubing or stem for wiring at one point, and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.

E. Adjust aim-able lighting luminaires to provide required light intensities.

3.2 SPARE LUMINAIRES

A. Provide the following installed spare luminaires:

<u>Item</u>	<u>Quantity</u>
Emergency Lighting Units	5%

- B. Spare devices shall include 100 feet of conduit and wiring as required for a complete installation. Location of these units to be determined by the Owner's representative at the site. The Contractor shall assume that these luminaires will be installed after all other work is completed. Installation shall occur on an accelerated (night/weekend) schedule. Unused luminaires are to be turned over to the Owner.

3.3 SPARE LAMPS AND BALLASTS

A. Provide the following spare lamps and ballasts/driver (each type):

<u>Item</u>	<u>Quantity</u>
Lamps – fluorescent/HID	5%
Lamps – LED Module	5%
Ballasts/Driver (each type)	5%

- B. Lamps and ballasts shall be turned over to owner.

3.4 WARRANTY

- A. Complete and submit all required forms on behalf of the Owner.
- B. Obtain a five-year lamp/ballast warranty certificate and include in the Operations and Maintenance Manual.

END OF SECTION 265100

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.
- B. Comply with all requirements of Division 26.
- C. Comply with the following applicable standards and codes:
 - 1. National Fire Protection Agency (NFPA) 70: National Electric Code (NEC) 2008
 - 2. ANSI/TIA/EIA-568-B.1 and addenda
 - 3. ANSI/TIA/EIA-568-B.2 and addenda
 - 4. ANSI/TIA/EIA-568-B.3 and addenda
 - 5. ANSI/TIA/EIA-569-A and addenda
 - 6. ANSI/TIA/EIA-606 and addenda
 - 7. ANSI/TIA/EIA-607 and addenda
 - 8. Building Industries Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM) 12th Edition.
- D. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.

1.2 DEFINITION

- A. Telecommunications Spaces:
 - 1. Equipment Rooms (ER)
 - 2. Telecommunication Rooms (TR)
- B. Cross-connects / Distribution Frames:
 - 1. Main Cross-Connect / Main Distribution Frame (MC / MDF)
 - 2. Horizontal Cross-connect / Intermediate Distribution Frame (HC / IDF)
- C. Pathway: Conduit, wall rack, cable runway, sleeves, saddle bags, and J-hooks.
- D. EMI: Electromagnetic Interference.
- E. RFI: Radio Frequency Interference.

1.3 SUMMARY

A. Pathway System:

1. In general, only devices have been shown on the drawings. The Contractor shall provide a complete pathway system.
2. Minimum raceway size shall be 3/4".
3. Provide metallic raceway from all outlet boxes. This raceway may be stubbed above ceiling except where raceway is required to be provided all the way to the wall rack.
4. Provide metallic raceways for cables in walls, above inaccessible ceilings, exposed, where subject to physical damage, or where subject to potentially high EMI or RFI.
5. Use J-hooks spaced no greater than 5 ft apart for open ceiling cabling between metallic raceway stubbed above ceiling and wall rack system shown in corridors.
6. All below grade wiring shall be in schedule 40 PVC conduit.

1.4 WIRE AND CABLE:

1. Comply with all requirements of Division 26 and other provisions of this section.
2. Unless specified otherwise, all cabling shall be plenum rated.
3. Provide wire and cable for each system according to the manufacturers requirements.
4. Underground cabling shall be I conduit and UL listed for direct burial or wet location.

1.5 SUBMITTALS

- #### A. Product Data: Submit for each type of product provided.

1.6 QUALITY ASSURANCE

A. Contractor Qualifications:

1. Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
2. Personnel trained and certified to install products.
3. Provide references of the type of installation provided in this specification.
4. Personnel to be competent in Termination, Splicing, Testing, Trouble Shooting Fiber and Copper Products.
5. Be in business a minimum of 5 years and successfully engaged in the routine installation of structured cabling systems (i.e. voice, data, fiber, video, etc.) of similar size and complexity.
6. Possess current liability insurance certificates.
7. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations.

- B. Warranty: Materials and workmanship hereinafter specified and furnished shall be fully guaranteed by the vendor for 20 years from acceptance and transfer of title against any defects and shall promptly correct or re-perform (including modifications or additions as necessary) any nonconforming or defective work that may occur during this period as a result of faulty materials or workmanship at no additional cost to the customer.
 - 1. The period of the vendor's warranty (ies) for any items herein are not exclusive remedies, and the customer has recourse to any warranties of additional scope given by the vendor to the customer and all other remedies available at law or in equity.
 - 2. The vendor shall pass along to the customer any additional warranties offered by the manufacturers, at no additional costs should said warranties extend beyond the 20 year period specified herein.
 - 3. This warranty shall in no manner cover equipment that has been damaged or rendered unserviceable due to negligence, misuse, acts of vandalism, or tampering by the customer or anyone other than employees or agents of the vendor. The vendor's obligation under its warranty is limited to the cost of repair of the warranted item or replacement thereof, at the vendor's option. Insurance covering said equipment from damage or loss is to be borne by the vendor until full acceptance of equipment and services.
 - 4. If the vendor procures equipment or materials under the Contract, the vendor shall obtain for the benefit of the customer equipment and materials warranties against defects in materials and workmanship to the extent such warranties are reasonably obtainable.
 - 5. All non-consumable products to have a 20-year guarantee. In order to qualify for the guarantee, the structured cabling system must be installed per the following:
 - a. Meet all TIA/EIA commercial building wiring standards.
 - b. Use products purchased from authorized distributors.
 - c. Products must be installed per manufacturer's instructions by a Certified Installer.
- C. All Networks shall be installed per applicable standards and manufacturer's guidelines.
- D. All manufacturers and part numbers are for performance standards only. Other manufacturers meeting the same performance standards as well as a minimum 20 year warranty will be accepted with prior approval via the formal RFI process.

1.7 COORDINATION

- A. Coordinate arrangement, mounting, and support of communications equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting pathways, cables, wireways, wall rack, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation with mechanical, plumbing, structural, electrical and other disciplines throughout all stages of construction.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Comply with all requirements of Division 26.
- B. Material purchased for this project are to be turned over to owner upon completion of the project.

2.2 PATHWAYS

- A. General Requirements: Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Only devices and wall racks have been shown on the drawings. The Contractor is responsible for providing a complete pathway system. The shop drawings shall contain a fully-designed pathway system.
- C. Cable routes shall not run through areas in which flammable materials may be stored or over or adjacent to boilers, incinerators, hot water lines, or steam lines. Proper distances shall be provided between cable routes and sources of heat, EMI, and RFI. Electromagnetic compatibility must be maintained for the cable system.
- D. Cable supports NRTL labeled for support of Category 6 Augmented cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 - 2. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 3. Lacing bars, spools, saddle bags, and J-hooks.
 - 4. Properly-rated Velcro straps. Plastic cable ties are not allowed.
 - 5. Shall not be attached to drop ceiling grid.
 - 6. Cables shall not be attached directly to grid wire. Grid wire shall not be wrapped around a cable bundle.
 - 7. Shall not be utilized through areas where EMI and RFI may cause interference or degrade system performance. Electromagnetic compatibility for the supporting system must be maintained throughout.
- E. Wall Rack: Fabricated structure consisting of (1) rectangular tube spine to which 6" long rungs, spaced at 9" on center are attached. The rungs shall be bent up to provide 4" deep space for cables. The wall rack must not have continuous side rails. Wall rack shall be constructed of either aluminum or galvanized steel.
 - 1. For horizontal cable distribution throughout corridors.
 - 2. Any change in direction or elevation of wall rack or cable shall have factory-recommended hardware (Tee's, 90's, waterfalls, proper fastening hardware, etc.). The only exception will be where cable exits tray for another distribution method (i.e. J-hooks, etc.) pathway, conduit, conduit stub-up, etc.) and no pinch points exist from doing so.

3. All cable trays and wall racks shall be grounded end-to-end to an approved building ground as described in TIA-942.
 4. Provide clearance of 6 inches above, 3 inches below, and 12 inches on one side from all other equipment, and system. After all building systems have been installed, wall rack clearances must be maintained along entire length. No material may penetrate or obstruct the pathway. Coordinate with other trades prior to tray installation.
 5. Grid wire may not be used with wall rack. Supports shall be per manufacturer's recommended load plus 50 percent.
 6. Wall racks shall only be utilized over areas with ceiling access and must transition to a minimum of three 3 inch conduits when routed over fixed ceiling spaces larger longer 10 feet.
 7. Other low-voltage systems with the exception of fire alarm, may share wall rack space where allowed by code if a minimum of 3 inch separation from voice/data system is maintained throughout. Prior coordination must take place before wall rack space can be shared. Voice/data system has priority use of wall rack.
 8. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. MP Husky #A9WL4-6
 - b. Mono-Systems, Inc.#B6_24-0__1
- F. Ladder Cable Runways: Nominally 12 inches wide and a rung spacing of 12 inches.
1. For cabling routing within Equipment Rooms and Telecommunication Rooms to rack mounted termination hardware.
 2. Mount and secure to walls and racks so as to provide vertical brace for racks.
 3. Shall be black in color.
 4. All cable trays and wall racks shall be grounded end-to-end to an approved building ground as described in TIA-942.
- G. Conduit and Boxes: Comply with requirements in Division 26, Section 260533, "Raceway and Boxes."
1. Flexible metal conduit and PVC conduit and sleeves shall not be used.
 2. LB type fittings are not to be used.
 3. Conduit runs shall follow the most direct route possible with no more than 180 degree bends between pull boxes and contain no continuous sections longer than 100 feet.
 4. Pull boxes must be accessible (after all mechanical systems are in place) and used for runs that exceed 100 feet in length and after every cumulative 180 degree changes in direction. All pull boxes must have the insulated bushing installed before cable is pulled.
 5. When multiple conduits are pulled to one box, the minimum box size should be 24 inches by 24 inches by 6 inches. All conduits must maintain run direction through the pull box (i.e. no changing of direction inside the box). The size of pull boxes is determined by the size of conduit leaving and entering the pull box.
 6. A pull string shall be provided in all conduits. Pull a new pull string separate of cabling.
 7. Conduit must be bonded to ground on one or both ends.
 8. Label all pull and junction boxes.
 9. Device boxes shall be 4" square, deep type.

2.3 FIRESTOPPING

- A. Comply with requirements in Division 07, Section 078413, "Penetration Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.
- C. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

2.4 GROUNDING

- A. Comply with requirements in Division 26, Section 260526, "Grounding and Bonding" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

2.5 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode and single mode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
- E. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- F. Cable will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall review all drawings, details and elevations and coordinate with the architect and mechanical contractor prior to installation.
- B. Install systems according to manufacturer's written instructions and shop drawings.
- C. Provide all raceways, wiring and ancillary equipment necessary for a complete and operational system.
- D. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. The contractor shall maintain the owner's facility in a neat and orderly manner during the installation of the communications cabling system. At the completion of work in each area, the contractor will perform a final cleaning of debris prior to moving the installation crew to the next work area.
- G. The contractor shall establish a single point of contact with the General Contractor who will be responsible for reporting progress and updating the owner's representative with issues that the owner must address to facilitate the cabling system installation. The contractor's point of contact (POC) shall provide weekly written reports detailing progress.

3.2 GROUNDING

- A. Comply with ANSI-J-STD-607-A.
- B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- C. Grounding system components shall be installed as described in TIA-942, meet the National Electrical Code (NEC), and comply with all local codes.
- D. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- E. Signal Ground Terminal: Locate at each equipment cabinet. Isolate from power system and equipment grounding.
- F. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
- G. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.
- H. Connect all Telecommunications Ground Bus Bars (TGB) to the Telecommunications Main Ground Bus Bar (TMGB) through the use of a Telecommunications Bonding Backbone (TBB). The TBB shall be installed independent of the building electrical and building ground per ANSI/TIA/EIA-607-A.
- I. All vaults must be grounded back to the TMGB.

3.3 PATHWAYS

- A. Cable Runways and Wall Racks: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27, Section 271100, "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26, Section 260533, "Raceway and Boxes" for installation of conduits and wireways.
- E. Comply with the material and installation requirements specified in Division 26, Section 260529, "Hangers and Supports."
- F. Provide long-radius elbows for all underground raceways. Install manufactured conduit sweeps and long-radius elbows elsewhere whenever possible.
- G. Cable minimum bend radius shall not be exceeded in any pathway, in any transition between pathways, or when branching off of a pathway.
- H. Raceway, cable runway, and wall racks, and all other pathways systems shall not exceed a 40 percent fill rate.
- I. All cable pathways shall keep cable bundle a minimum of 6 inches off of the ceiling grid system. Ceiling grid shall in no way support any cable or cable pathway.
- J. Saddle bags or J-hooks shall be spaced no greater than 5 ft apart for open ceiling cabling. Cables shall be properly supported and not sag between supports. Sag indicates additional supports are required.
- K. All cables, whether individual or grouped, shall be supported by an approved pathway system.
- L. All cable pathways including saddle bags and J-hooks and the pathways they create shall follow building lines and allow access to cabling from hallway and open area locations. Pathways shall not be placed over other end user offices.
- M. Cables pathways may only run parallel with electrical conduits if within cable manufacturer's recommendations and electromagnetic compatibility can be maintained so that no EMI and RFI may cause interference or degrade system performance.
- N. Exposed conduit/surface-mount is not allowed and can only be used with written permission from the project manager.
- O. Entire length of cable pathway shall be cleaned by conclusion of project. No debris such as clipped cable ties, junk pull string, wall penetration packaging or pieces or other trash is to be left in the ceiling.
- P. Do not install any cabling prior to approval from owner provided field inspector.

3.4 WIRING

- A. Do not share raceways with other building wiring systems.

- B. Wiring Within Enclosures: Bundle, lace and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and nonpower-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Splices, Taps and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets, and equipment enclosures.
- D. Identification of Conductors and Cables: Color code conductors and apply wire markers. Coordinate with shop drawings.

3.5 SLEEVES

- A. Interior Penetrations of Nonrated Walls, Floors and Ceilings: Provide EMT sleeves. Seal space between the raceway and the wall or floor using joint sealant appropriate for the size, depth and location of the joint. Comply with requirements in Division 07, Section 079200, "Joint Sealants."
- B. Extend sleeves installed in floors 1 to 3 inches above finished floor level.

3.6 FIRESTOPPING

- A. Communications penetrations occur when pathways, cables, wireways, or wall racks penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies. This includes both through (complete penetration) and membrane (through one side of hollow fire rated structure) penetrations.
- B. Provide firestopping to all penetrations of fire-rated assemblies to restore original fire-resistance rating of assembly including resistance to flame, heat, vapor, and water stream pressure. When penetrating corridor/chase walls, a minimum of 2 engineered firestop devices are required.
- C. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- D. Comply with BICSI TDMM, "Firestopping Systems" Article.
- E. Contractor shall install appropriate size and quantity to maintain maximum 40 percent fill.
- F. Install approved mechanical fire-rated assemblies for corridor firewalls, Equipment Room and Telecommunication Room penetrations. Install sleeves and seal with appropriate fire materials for penetrations only where mechanical fire-rated assemblies cannot be installed per manufacturer's requirements.
- G. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

- H. Sleeves in Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- I. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections to ensure all cables and termination hardware is 100 percent free of defects and meets performance standards under installed conditions. Test cables after termination but not cross-connection.
- B. All tests shall indicate the appropriate cable identification number, circuit, or pair number.
- C. Test instruments:
 - 1. Shall meet or exceed applicable requirements in TIA/EIA-568-B.1, TIA/EIA-568-B.2, and TIA/EIA-568-B.3. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex.
 - 2. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation.
 - 3. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 4. For UTP Category 6 performance tests, use at minimum a Fluke DTX Level IV tester that has been factory-calibrated within the last 12 months. Submit copy of calibration certification. Category 6 cabling systems shall be performance verified using an automated test set capable for testing all specified parameters.
- D. Visual Inspections:
 - 1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1
 - 2. Visually confirm Category 6 or Category 6 Augmented markings of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
- E. UTP Cable Tests:
 - 1. Wire map test showing:
 - a. Continuity on all pairs.
 - b. Shorts between any two conductors.
 - c. Reversed pairs.
 - d. Transposed pairs.

- e. Split pairs.
 - f. Shield continuity (if applicable)
 - g. Grounded conductor
 - h. Pass/Fail Result
 - 2. DC loop resistance.
 - 3. Length (physical vs. electrical, and length requirements).
 - a. Use TDR type device.
 - b. Tested from patch panel to patch panel, block to block, patch panel to outlet, or block to outlet as appropriate.
 - c. Length shall conform to maximum distance set forth in ANSI/TIA/EIA-568-B.
 - d. Record length of longest pair.
 - 4. Insertion loss.
 - 5. Near-end crosstalk (NEXT) loss.
 - 6. Power sum near-end crosstalk (PSNEXT) loss.
 - 7. Equal-level far-end crosstalk (ELFEXT).
 - 8. Power sum equal-level far-end crosstalk (PSELFEXT).
 - 9. Return loss (RL).
 - 10. Propagation delay.
 - 11. Delay skew
- F. Optical Fiber Cable Tests:
- 1. Link End-to-End Attenuation Tests.
 - a. Multimode Fiber link measurements: Test at 850 and 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - b. Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
 - c. Singlemode Fiber link measurement: Test at 1310 and 1550 nm in 1 direction.
 - d. Conversion from metric to US Standard measurement shall use 3.2808 as a constant with the result rounded to the next highest whole number.
 - e. The adjusted cable attenuation value shall be added to the manufacturers mean loss per mated pair of connectors multiplied by the number of mated pairs under test (the testing for this project measures the loss over the installed cable plus two jumpers which accounts for three mated pairs of connectors - subtract one mated pair for the equipment interface to arrive at a total of two mated pairs under test).
 - f. Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested.
 - g. The expected results for each cable (or group of cables of the same nominal length) shall be calculated before the start of testing and recorded in a space provided on the Contractor's test matrix. Any fibers that exceed this value shall be repaired or replaced at no cost to the Owner.

2. Length and Splice loss measured via Optical Time Domain Reflectometer (OTDR) accordance to ANSI/TIA/EIA-455-60 (FOTP-60)
 - a. Refer to Tier 2 testing in TIA/TSB-140.
- G. Coaxial Cable Tests:
 1. Conduct tests according to Division 27 Section "Cable Television System."
- H. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.
 1. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 2. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- I. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- J. Document Data for each measurement and prepare test and inspection reports. Documentation shall be provided in original electronic format as well as PDF on CD for approval. Also provide printed test results obtained directly from the test equipment. Hand written or excel or word typed test results will not be accepted.
 1. The CD shall have separate folders labeled Horizontal and Backbone and then be further segregated in subfolders by test type (i.e. scanner, fiber optic attenuation, OTDR traces, power meter test results, etc.).
 2. Test data within each section shall be presented in the sequence listed in the administration records.
 3. The test equipment by name, manufacturer, model number and last calibration date shall also be provided at the end of the document.
 4. The test document shall detail the test method used and the specific settings of the equipment during the test.
 5. The test report shall include the test performed, expected test result and the actual test result achieved.
- K. The Pass or Fail condition for the cabling run under test is determined by the results of the required individual tests. In order to achieve an overall Pass condition, the results for each individual test parameter must be a Pass. A test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. This shall be considered a Fail test result.
- L. Any defect in the cabling system 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 in all installed cables. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted. Only "Pass" results and not Marginal Pass* will be accepted.

3.8 IDENTIFICATION

- A. Identify system components, wiring, cabling and terminals according to Division 26, Section 260553, "Identification."

3.9 AS-BUILT SHOP DRAWINGS

- A. At the completion of the project, provide a complete set of as-built shop drawings (hard copy and CD) showing the following as-built:
 - 1. Raceway layout
 - 2. Wiring
 - 3. Device locations
 - 4. Device identification numbers

END OF SECTION 270500

SECTION 270533 - CONDUITS AND BACK BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section governs the products and installation of conduits, back boxes, and additional accessories, connections, fittings, and equipment required for in-building communications systems, otherwise known as “Electrical Rough-in”.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

- A. Conveniently Accessible – being capable of being reached from the floor or use of 8-foot step ladder without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.
- B. IMC – Intermediate Metal Conduit
- C. Listed Communications Cable – A cable listed by a Nationally Recognized Testing Laboratory (NRTL) and acceptable to the local Authority Having Jurisdiction (AHJ) as having met appropriate designated standards or has been tested and found suitable for installation in specific spaces. Refer to NEC Articles 725, 770, and 800 for listing types and additional requirements. Assume Outside Plant (OSP) Cables being supplied are not Listed.
- D. Plenum – A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
- E. Plenum-rated – A product that is Listed by a NRTL as being suitable for installation into a plenum space. Communications cabling shall be Listed and identified as type CMP.
- F. Point of Entrance (Building Entrance) – The point within a building at which the OSP communications wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) connected by a grounding conductor to an electrode in accordance with the NEC.
- G. RMC – Rigid Metal Conduit
- H. UL – Underwriters Laboratory

1.4 SUBMITTALS

- A. The following submittals are due at the Pre-Construction Phase, in accordance with submittal requirements in Section 270500 Special Systems:
 - 1. Product Information
 - a. Provide table of contents with all product names, manufacturer, and specific product number identified to accompany manufacturer cut-sheets.
 - b. Provide manufacturer's product information cut sheet or specifications sheet with the specific product number identified or filled out.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Refer to Electrical specifications for additional information.

2.2 CONDUIT

- A. Refer to execution section for sizing and installation requirements.
- B. Refer to Electrical specifications for list of approved manufacturers.
- C. The minimum conduit trade size for telecommunications shall be 3/4-inch.

2.3 BACKBOXES

- A. At minimum, the typical communications backbox shall be 4-11/16-inch square by 2-1/8- inch deep with 1-1/4-inch knockouts and a 4-11/16-inch Square Mud-Ring for one (1) device (single-gang) unless noted otherwise.

2.4 PULLBOXES

- A. Material shall be aluminum or steel.
- B. Refer to execution section for sizing and installation requirements.

PART 3 – EXECUTION

3.1 GENERAL

- A. Contractor shall follow all manufacturer's instructions.
- B. Coordinate with all other trades prior to installation.

3.2 CONDUIT

- A. Conduit size to telecommunications outlets shall be minimum trade size 3/4-inch unless otherwise noted.
- B. Conduits which enter Telecommunications Spaces shall extend:
 - 1. 4-inches above finished floor, or
 - 2. 3-inches below finished ceiling, or
 - 3. 3-inches through wall
- C. Conduits shall be reamed and bushed.
- D. Telecommunications building entrance conduits shall be RMC or IMC construction and shall extend to within 50-feet cable length from the location reserved for Building Entrance Protection in the Entrance Facility.
- E. Minimum Bend Radius
 - 1. For trade size conduits 2-inches or less, maintain a minimum bend radius of six (6) times the actual inside diameter of the conduit.
 - 2. For trade size conduits greater than 2-inches, maintain a minimum bend radius of ten (10) times the actual inside diameter of the conduit.
- F. No continuous section of conduit may exceed 100-feet. Utilize pull boxes as necessary.
- G. No continuous section of conduit may include more than two (2) 90 degree bends (or equivalent).
- H. Conduit to Floor Boxes in Slab-on-Grade
 - 1. Slab-on-grade conduits shall not be installed.
- I. Flexible Conduit
 - 1. As defined by the NEC.
 - 2. To be utilized only at specific locations identified on the drawings and previously approved by the Engineer or Owner prior to installation.
 - 3. Sections are to be limited to a maximum of 20-feet in length and the trade-size shall be increased by one. The minimum trade size shall be 1-inch unless otherwise noted and approved.

3.3 BACKBOXES

- A. Back boxes installed into fire-rated walls shall include appropriate fire-stopping system.
- B. Where back-to-back with outlet on opposite side of wall, off-set one of the back boxes and conduits to adjacent stud cavity or masonry block.

3.4 PULLBOXES

- A. Angle, U-pulls, or Directional changes within a pull box shall not be allowed.
- B. Straight Pulls. In straight pulls, the length of the box shall not be less than eight (8) times the trade size of the largest conduit.
- C. For Straight Pulls, size pull boxes according to the following table:

Conduit Trade Size	Min. Width	Min. Lengt	Min. Depth	Width Increase for Additional
1"	4"	8"	3"	2"
1-1/4"	6"	10"	3"	3"
1-1/2"	8"	12"	4"	4"
2"	8"	16"	4"	5"
2-1/2"	10"	20"	6"	6"
3"	12"	24"	6"	6"
4"	16"	32"	8"	6"

- D. Install pull boxes in conveniently accessible locations.

END OF SECTION 270533

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

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 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International, Inc.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference
- E. IDC: Insulation displacement connector
- F. LAN: Local area network
- G. MUTOA: Multiuser telecommunications outlet assembly; a grouping in one location of several telecommunications outlet/connectors.
- H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- I. UTP: Unshielded twisted pair

1.3 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the Telecommunications Room and the point of use devices. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
 - 1. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 - 2. Bridged taps and splices shall not be installed in the horizontal cabling.
 - 3. Splitters shall not be installed as part of the optical fiber cabling.
 - 4. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

5. Do not pull separate cable for telephone. Telephone connections are included as one of the Category 6 cables at every location.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

1.5 SUBMITTALS

- A. Product Data: Submit for each type of product provided.

1.6 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

PART 2 – PRODUCTS

2.1 PATHWAYS

- A. Comply with requirements in Division 27, Section 270500, “Common Work Results for Communications”.

2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Berk-Tek
 2. CommScope
 3. Mohawk
 4. Optical Cable Corp.
 5. Superior Essex
 6. Leviton
- B. Description: 100-ohm, solid conductor, four-pair UTP, Category 6 for general outlets and Integrated Systems. Category 6a for Wireless Access Point's. Cat 6 cables shall be covered with a blue thermoplastic jacket and Cat 6a shall have a white jacket.
 1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 3. Comply with TIA/EIA-568-B.2, Category 6 or 6a.

- C. Install cables from the nearest Telecommunications Room to each of the following:

1. Two cables to standard data outlets, unless noted otherwise.
2. One cable (Cat 6a) to Wireless Access Points.

2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berk-Tek
2. Commscope
3. Mohawk
4. Optical Cable Corp.
5. Superior Essex
6. Leviton

- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category.

- C. Connecting Blocks: 110-style IDC for Category 6 or 6a to match cable. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables. One terminal per field for each conductor in assigned cables.

- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables. One jack per field for each four-pair UTP cable indicated. Cat 6 or 6a rated to match cable.

- F. Jacks and Jack Assemblies: Modular, Cat 6 or 6a to match cable, eight-position modular receptacle units with integral IDC-type terminals.

2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1, Cat 6 or 6a to match cable.

- B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26, Section 262726, "Wiring Devices."
2. Snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks.

- b. Legend: Machine printed in the field using adhesive-tape label. Sequential labeling from left to right, top to bottom.
 - c. Sequential labeling of jacks from left to right, top to bottom. Each jack shall be numbered with the same number as attached cable.
 - d. Blank inserts/modules shall match faceplate in color.
 - e. Category jacks shall match faceplate color. Modules shall accept icon designators.
 - 1) Black icon indicating a data/PC connection
 - 2) Blue icon indicating a voice/telephone connection
 - 3) Yellow icon indicating a voice/telephone connection
 - f. BNC coaxial bulkheads shall match faceplate in color.
 - g. Shall snap into all outlets and modular patch panels.
- 3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.
- C. Outlet Boxes:
 - 1. Comply with requirements in Division 26, Section 260533, "Raceway and Boxes." Shall be no smaller than 4-11/16 inches wide, 4-11/16 inches high, and 3 inches deep.
- D. Floor boxes and Poke-Thru Devices:
 - 1. For connection to modular furniture, provide 2-inch pathway for cables.
 - 2. For plug in at floor locations, provide faceplate and jacks and ensure permits installation of Category cables.
 - 3. Poke-thru must have the same or higher fire-rating as the floor it penetrates.
 - 4. Provide metal separation between electrical and telecommunication cables.
 - 5. Provide all covers, top plates, carpet rings, angle connectors, conduit, jacks, and hinged covers for floor boxes and poke-thrus.
- E. Wall Phone Faceplates: mounted per ADA forward reach specifications. Wall phone locations will have only 1 Category 6 cable pulled to each location.

2.5 FIRESTOPPING

- A. Comply with requirements in Division 27, Section 270500, "Common Work Results for Communications".

2.6 GROUNDING

- A. Comply with requirements in Division 27, Section 270500, "Common Work Results for Communications".

2.7 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

- B. Comply with requirements in Division 26, Section 260553, "Identification."
- C. Each and every cable will be uniquely identified and will have the same identification at the jack and telecommunications room or equipment room. Provide labels at approximately 6 inches from termination on each end.
- D. All labels will be computer generated, wrap-around, self-laminating, and will be permanent. No permanent markers are to be used for final labeling.
- E. Owner will provide labeling and numbering format along with port numbers for both work area outlets and telecommunication rooms and equipment rooms.

2.8 SOURCE QUALITY CONTROL

- A. Comply with requirements in Division 27, Section 270500, "Common Work Results for Communications".

PART 3 – EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Division 26, Section 260533, "Raceway and Boxes."
 - 3. Conceal conductors and cables in accessible ceilings, walls and floors where possible.
- B. Wiring within Enclosures: Bundle, lace and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- C. All horizontal cables shall be wired according to T568B pin/pair assignments.

3.2 PATHWAYS

- A. Comply with requirements in Division 27, Section 270500, "Common Work Results for Communications".

3.3 CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. MUTOA shall not be used as a cross-connect point.
6. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
 - c. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than six inches from cabinets, boxes, fittings, outlets, racks, frames and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Pulling tension above maximum allowable tension for cable being used will result in the cable being deemed damaged.
11. Do not install bruised, kinked, scored, deformed or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable regardless of whether the cable passes Category 6 or 6a testing standards.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. Install a 10-foot-long service loop on each end of cable In the communications equipment room.
14. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of eight inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
 - 1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2kVA: A minimum of five inches.
 - b. Electrical Equipment Rating Between 2 and 5kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5kVA: A minimum of 24 inches.
 - d. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - e. Electrical Equipment Rating Less Than 2kVA: A minimum of 2-1/2 inches.
 - f. Electrical Equipment Rating Between 2 and 5kVA: A minimum of six inches.
 - g. Electrical Equipment Rating More Than 5kVA: A minimum of 12 inches.
 - h. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - i. Electrical Equipment Rating Less Than 2kVA: No requirement.
 - j. Electrical Equipment Rating Between 2 and 5kVA: A minimum of three inches.
 - k. Electrical Equipment Rating More Than 5kVA: A minimum of six inches.
 - 3. Separation between Communications Cables and Electrical Motors and Transformers, 5kVA or HP and Larger: A minimum of 48 inches.
 - 4. Separation between Communications Cables and Fluorescent Fixtures: A minimum of five inches.

3.4 FIRESTOPPING

- A. Comply with requirements in Division 27, Section 270500, "Common Work Results for Communications".

3.5 GROUNDING

- A. Comply with requirements in Division 27, Section 270500, "Common Work Results for Communications".

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26, Section 260553, "Identification."
 - 1. Administration Class: 3.
 - 2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers and labels.

- B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing and management. Use unique alphanumeric designation for each cable and label cable, jacks, connectors and terminals to which it connects with same designation. Cable and asset management software shall reflect final as-built conditions.
- C. Comply with requirements in Division 09, Section 099123, "Interior Painting" for painting backboards. Do not paint over manufacturer's label for fire-resistant plywood.
- D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for project.
- F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets; backbone pathways and cables; entrance pathways and cables; terminal hardware and positions, horizontal cables, work areas and workstation terminal positions; grounding buses and pathways; and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings in software and format selected by Owner.
- G. Cable and Wire Identification:
 - 1. Label each cable within four inches of each termination and tap where it is accessible in a cabinet, junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each terminal strip and screw terminal in each cabinet, rack or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device shown.
 - b. Label each unit and field within distribution racks and frames.
 - c. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Use a different color for jacks and plugs of each service where similar jacks and plugs are used for both voice and data communication cabling.
 - 5. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.
- H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color, but still complies with requirements in TIA/EIA-606-A. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Comply with requirements in Division 27, Section 270500, “Common Work Results for Communications”.

END OF SECTION 271500

SECTION 280500 - ELECTRICAL REQUIREMENTS FOR INTEGRATED SECURITY SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. This section is a Division 28 Basic Electrical Materials and Methods section, and is part of each Division 28 section.
- B. Drawings and General Provisions of contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. This section shall indicate the scope of work required by the Division 26 Electrical Contractor to coordinate with the Integrated Security Systems installation. The general term “Integrated Security Systems” shall include Intrusion, Access Control, and Surveillance.
- B. The Division 26 contractor shall install all raceway, boxes, low voltage cabling, to the existing security system infrastructure. Division 26 contractor shall coordinate all related work with the Integrated Security Systems contractor.
- C. The Integrated Security Systems contractor will be under direct contract to Owner.

1.3 CONTRACTOR INTERFACE AND COORDINATION

- A. This installation requires extensive interfacing - It is the sole and exclusive responsibility of this contractor to clarify any questions or discrepancies with the Integrated Security System contractor and the Owner’s representative and to ascertain and verify all installation conditions about which he is unsure prior to commencing work. No additional post bid allowances will be made.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Raceway systems including conduit, boxes, cable tray, supporting devices, etc. shall be as specified in other Division 26/27 sections.
 - 1. All security wiring in shop and open bay areas to installed in rigid conduit.
 - 2. Exterior security wiring shall be rigid conduit above grade and schedule 40 pvc below grade.

- B. Backboards shall be furnished and installed by the Electrical Contractor. Backboard shall be 3/4" plywood (AD grade), one side finished smooth, painted with two coats of white fire retardant paint. Sizes as indicated on the drawings.
- C. Cable Supports and Wraps
1. Cable Supports (J-Hooks, Straps): Complete with incidental materials and assemblies required for mounting.
 - a. Approved manufactures are Caddy, B-Line, or equal.
 - b. Bridal rings are not approved for use.
 - c. J-Hook width shall be minimum 3/4". Provide size appropriate for conductor quantity. Multi-Tier J-Hooks shall be provided to separate different low voltage systems where a common route or pathway is used.
 - d. Acceptable alternate product: Caddy #CATCR50 cable retainer
 - e. Cable supports shall only be used above drop ceilings.
 2. Tie-Wrap:
 - a. Approved manufactures are Leviton or equal.
 - b. Tie-Wraps shall be recloseable loop wrap style. Available in 1/2" wide, 15'-75'bulk rolls of Hook and Loop Wrap.
 - c. Plastic fasteners are not approved for use.

2.2 CABLE

- A. Division 26/27 shall furnish and install the following cable types from each device. The following cable is distributed by C.W.C. Inc., Kent, WA, (253) 872-6590. Or equal substitution permitted.

DEVICE	CABLE DESCRIPTION	CAT. NO.
1. Door Position Switch	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04
2. Electromagnetic Door Lock or Strike	6C #22 OAS Yellow Plenum	Lake Cable # P226CS-04
3. Door Release Pushbutton	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04
4. Request-to-Exit Motion Detector	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04
5. Access Control Card Reader	6C #22 OAS Yellow Plenum	Lake Cable # P226CS-04
6. Motion Sensor (Occupancy Sensor)	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04
7. Glass Break Detector	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04
8. Window Position Switch	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04

9. Annunciator	4C #22 OAS Yellow Plenum	Lake Cable # P224CS-04
10. Siren	2C #18 OAS Yellow Plenum	Lake Cable # P182CS-04
11. Magnetic Lock	2C #18 OAS Yellow Plenum	Lake Cable # P182CS-04
12. Camera, Indoor, Fixed Position	(1) 2C #18 OAS Yellow Plenum CAT 5E Yellow Plenum	Lake Cable # P182CS-04 Coleman # 966956-16-02
13. Camera, Outdoor, Fixed Position	(2) 2C #18 OAS Yellow Plenum CAT 5E Yellow Plenum	Lake Cable # P182CS-04 Coleman # 966956-16-02
14. Camera, Indoor and Outdoor, PTZ	(2) 2C #18 OAS Yellow Plenum CAT 5E Yellow Plenum	Lake Cable # P182CS-04 Coleman # 966956-16-02
15. Blue Strobe	2C #18 OAS Yellow Plenum	Lake Cable # P182CS-04
16. Speaker/Mic	2C #18 OAS Yellow Plenum	Lake Cable # P182CS-04
17. Sounder (Pizo)	2C #18 OAS Yellow Plenum	Lake Cable # P182CS-04
18. Video Monitor	RG-59 Shld Coax Yellow Plenum	Tappan # P20RG59FM/CMP

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION

- A. All cables shall be installed as individual home runs from the device to the head-end equipment. No mid-run cable splices will be allowed.
- B. Visually inspect all wire and cable for faulty insulation prior to installation.
- C. Neatly coil 24” free cable at the device outlet and coil and bundle 20’ of free cable at the head-end equipment.
- D. Provide supports as required at 4’-0” intervals minimum. Integrated Security Systems cabling shall be supported separately from other low voltage system wiring. Install multiple J-hooks where to separate various systems where a common routing path is used.
- E. Neatly bundle and wrap all horizontally run wire and cable at maximum 5’ - 0” intervals.
- F. Cables run in open bay areas shall be run in rigid conduits.

- G. All system wiring within vertical riser shafts (if required) shall be bundled, wrapped and tied to the structure at 10'-0" intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using Greenlee Slack Strips (split mesh lace closing) or approved equal. Provide all personnel and equipment necessary to install and support the cable. All wire and supports shall be UL listed for the application.
- H. Wire and cables shall be protected from physical damage by ensuring that the bundles are kept off the floor in traffic areas. Care shall be taken to ensure that excess stress is not placed on large bundles of wire and cable at the Head-end. Adequate means shall be provided for fully protecting all materials and equipment against damage from any cause until final acceptance of the work.
- I. Provide grommets and strain relief material where necessary to avoid abrasion and tension on the wire and cable.
- J. Testing: Wiring shall be completely installed and tested for continuity, short circuits, and ground faults before final connections by the Integrated Security Systems contractor are made. Use approved Megger tester.
- K. Labeling: Identify both ends of each wire with room number or location of component to match identification or wiring diagram. Wire markers shall be located adjacent to connection point here easily visible. Marking system shall be Brady IDPro Printer with WML-311-292 labels or approved equal.
- L. Mark all cables in common at both ends using a permanent method such as self-laminating write-on cable marking tape. Tags shall be installed when wire and cables are installed. Permanent labels will be installed by the Integrated Security Systems contractor when terminations are made.
- M. Bond all systems raceways per Section 260526.
- N. Stub conduits from device outlet box to accessible ceiling. Install insulated throat liner or insulated bushing at stub end.
- O. Provide wiring and connections for all line voltage equipment panels and power supplies as required by the Integrated Security Systems contractor.
- P. Coordinate the routing of low voltage wire and cable to avoid interference from line voltage systems. Separate parallel runs by 12". Crossing runs shall be separated 6". Do not allow Class 2 cable to be housed or come into contact with Class 1, power or lighting cable. Observe all requirements of NEC including Article 725 and 760.
- Q. Sleeves shall be installed at each cable penetration through walls, floors and ceilings. Sleeves shall be minimum 3/4" with insulated inserts. Sleeves shall be installed regardless of wall type construction, fire rated or non-fire rated.

- R. Firestop all conduits that pass through fire rated floors, ceilings and walls. Sealing of openings between floors, through rated fire and smoke walls, existing or created by the contractor for cable pass through shall be the responsibility of the contractor. Sealing material and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the contractor's work. Any openings created by or for the contractor and left unused shall also be sealed as part of this work.
- S. In no instance shall any UL labeled door or frame be drilled, cut, penetrated or modified.
- T. Roof penetrations are not allowed unless specifically approved by the architect and shown on the drawings. The cable should be brought in through the wall (with a drip loop) instead of through the roof. In those cases where a roof penetration is absolutely necessary, a 1" conduit should be installed and the cabling run through that. The roof flashing/repair shall be performed by a qualified roofing contractor normally in the business of commercial roofing. Flashing shall be in accordance with NRCA standard practices.
- U. Seal all outdoor system components or those subject to water or moisture with neoprene gaskets or silicon sealant. Use a UL listed compound for all watertight seals. Contractor shall ensure that exterior wall penetrations are installed in such a manner as to prevent water seepage.
- V. All cutting and patching of new and existing construction required for the installation of systems and equipment shall be the responsibility of this contractor. All cutting shall be accomplished with masonry saws, drills or similar equipment to provide neat uniform openings. Refer to other Division 26/27 specification sections for complete cutting and patching information.

3.2 SUMMARY OF INSTALLATION REQUIREMENTS FOR INTEGRATED SECURITY SYSTEMS

- A. Division 26/27/28 shall furnish and install the following:
 - 1. Outlet boxes at each device location: 4"x2-1/8" square box with 1-gang ring.
 - 2. 3/8" flex into door frames for door position switches.
 - 3. Stub out 3/4" conduit from each box to accessible ceiling space.
 - 4. Sleeve all cable penetrations through walls, floors and ceilings.
 - 5. Grounding and bonding.
 - 6. Wire and cable from each device to head-end equipment.
 - 7. Label and tag wire and cables.
 - 8. Test wire and cables for continuity and short-circuit.
 - 9. Support, bundle and tie cables.
 - 10. 3/4" thick communications backboards.
 - 11. Firestopping around conduits that penetrate fire rated floors, ceilings and walls.
 - 12. All 120 VAC power connections.

END OF SECTION 280500

SECTION 311000 - 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. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Stripping and stockpiling rock.
 - 6. Removing above- and below-grade site improvements.
 - 7. Disconnecting, capping or sealing, and removing site utilities
 - 8. Temporary erosion and sedimentation control.

1.3 DEFINITIONS

- A. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally 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 larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.7 FIELD 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 trafficways if required by Owner or authorities having jurisdiction.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified.
- 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 and the sediment and erosion control Drawings.
- 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 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Remove utility backfill below the building footprint and replace with satisfactory soil materials as specified in Section 312000 "Earth Moving".
- B. 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 Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal of trees and shrubs within area of new construction shall include digging out stumps and obstructions and grubbing roots. Removal of trees in areas adjacent to trees that are to remain and be protected shall include tree removal and grinding of stump to 3" below finished grade. Stump and root removal is not allowed in these areas to preserve health of adjacent trees.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 - 4. Use only hand methods for grubbing within tree protection zone.
- 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 (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
 - 2. Approximate stripping depth is 3 to 4 inches per the Geotechnical Evaluation.

3. These depths are a guideline based on anticipated site conditions and subject to the approval of the Owner's Testing Agency.
- C. Stockpile 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 72 inches (1800 mm).
 2. Do not stockpile topsoil within tree protection zones.

3.7 STOCKPILING ROCK

- A. Remove from construction area naturally formed rocks that measure more than 1 foot (300 mm) across in least dimension. Do not include excavated or crushed rock.
 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
 1. Limit height of rock stockpiles to 36 inches (900 mm).
 2. Do not stockpile rock within protection zones.
 3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

3.8 ROCK EXCAVATION

- A. Drilling and excavation of rock to be in accordance with the requirements set forth on Sheet S0.1 and SH.0.
- B. It is the responsibility of the Contractor to determine the method of rock removal and that the method(s) selected are allowed by and acceptable to the City of Spokane including compliance with any and all Municipal Codes and Ordinances. The contractor is required to test sections to see that the method used is producing a satisfactory face and to develop the best methods for the particular rock formation encountered.
- C. Locations of shallow bedrock have been identified within the project footprint. The contractor shall assume 525 CY of bedrock to be excavated and disposed. Load/disposal tickets will be used to verify actual quantity disposed and adjustments (+ or -) made to the contract based on those actual quantities and labor cost agreed upon between STA and the contractor. The quantity above assumes 2.0 Tons/CY.
- D. Unit pricing from project bid form to be used in the event additional removal and disposal of rock is needed.

3.9 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- 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 along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.
 - 3. Backfill depressions caused by removing site improvements according to the requirements of Section 312000 "Earth Moving".

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. 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.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Recommendations provided in the Geotechnical Engineering Evaluation, dated February 5, 2015 prepared by GeoEngineers apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, and landscaping.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Base course for walks and pavements.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating and backfilling for underground utilities and buried utility structures.
 - 7. Geotextile Fabric for contaminated soil separation
- B. Work and materials shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, work and materials shall comply with the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.
- C. Related Sections include the following:
 - 1. Section 311000 "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 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 subgrade and walk or pavement.

- 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. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- F. Fill: Soil materials used to raise existing grades.
- G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, manholes, catch basins, drywells, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base course, drainage fill, or topsoil materials.
- J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- 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.
 - 3. Submit certification that the soil materials are acceptable and meet the Project requirements.
- 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.

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.6 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.
- 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 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- 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. Base Course: Crushed rock surfacing used for base course shall conform to WSDOT Standard Specifications section 9-03.9(3), Crushed Surfacing consisting of "Base Course" and "Top Course".
- E. Structural Fill: Structural fill material shall consist of clean, free-draining sand, or a sand and gravel mixture, each containing not more than 5 percent fines by weight (fines defined as silt and clay sized particles passing the U.S. No. 200 sieve). Structural fill shall be free of debris, organic material, frozen soil, and rock particles greater than 4 inches in diameter. Structural fill shall conform to WSDOT Standard Specifications section 9-03.14(1), "Gravel Borrow".
- F. Drainage Course: Structural fill placed as a capillary break material below slabs shall consist of 1 ½ inch minus clean crushed gravel with negligible sand or fines in conformance with WSDOT Standard Specification section 9-03.1(4)C, "Grading No. 57".
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand in conformance with WSDOT Standard Specification section 9-03.12(3).
- H. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and WSDOT Standard Specification section 9-33, "Construction Geosynthetic".
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and WSDOT Standard Specification section 9-33, "Construction Geosynthetic".

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; 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.
- B. 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

2.4 FILTER FABRIC

- A. Filter Fabric: Non-woven geotextile meeting the requirements of WSDOT section 9-33.2(1) for separation geotextile.

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 as specified in Section 311000 "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Section 311000 "Site Clearing," during earthwork operations.
- D. Protect subgrades and foundation soils against freezing temperatures and 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. 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.
 - 2. Install a dewatering system to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered.

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.

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.
2. Excavation for Underground Tanks, Basins, and 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.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
- B. Scarify, moisture-condition (wet or dry the soil) and recompact the upper 8 inches of any subgrade below walks or pavements to compaction requirements in Section 3.14 – Compaction of Soil Backfills and Fills of this specification.

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.
 2. Utility trenches shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, utility trenches shall comply with the most current edition of the Standard Specification for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.
- 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 minimum each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
- D. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

3.8 SUBGRADE INSPECTION

- A. Notify Geotechnical Testing Agency when any subgrade is achieved. Do not backfill subgrades until Geotechnical Testing Agency has determined the subgrade meets the Contract requirements. If Geotechnical Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- B. Proof-roll subgrade below the building slabs and pavements to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Testing Agency, and replace with compacted backfill or fill as directed.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Geotechnical Testing Agency without additional compensation.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrowed 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.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade.
 - 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.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 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. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

- D. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- E. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 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, use satisfactory soil material.
 - 2. Under walks and pavements, use structural fill.
 - 3. Under steps and ramps, use structural fill.
 - 4. Under building slabs, use structural fill.
 - 5. Under footings and foundations, use structural fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 4 percent of optimum moisture content, as determined by ASTM D 1557.
 - 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 4 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in loose lifts with thickness appropriate for the equipment used but not exceeding 12-inches. Mechanically compact to a firm, non-yielding condition. Each lift should be conditioned to the proper moisture content and compacted to the specified density before placing subsequent lifts.
- 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, scarify and recompact top 12 inches of existing subgrade and compact each layer of backfill or fill soil material at 95 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 lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent. In areas intended for future development, a higher degree of compaction should be considered to reduce the settlement potential of the fill soil.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.15 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 or Pavements: 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.

3.16 BASE COURSE

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 1. Place base course material over subgrade under pavements and walks.
 2. Shape base course to required crown elevations and cross-slope grades.
 3. Place base course 6 inches or less in compacted thickness in a single layer.
 4. Place 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.
 5. Compact 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.

3.17 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 slabs-on-grade as follows:
 - 1. Place drainage course 6 inches or less in compacted thickness in a single layer.
 - 2. 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.
 - 3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage and pay for services of 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, verified by the geotechnical engineering testing agency.
- 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 for each 100 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.

3.19 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 geotechnical engineering testing agency; 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.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 312000

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Requirements:
 - 1. Section 013233 "Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
 - 2. Section 312000 "Earth Moving" for excavating and backfilling, for controlling surface-water runoff and ponding, and for dewatering excavations.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Review geotechnical report.
 - 2. Review existing utilities and subsurface conditions.
 - 3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
 - 4. Review proposed excavations.
 - 5. Review proposed equipment.
 - 6. Review monitoring of excavation support and protection system.
 - 7. Review coordination with waterproofing.
 - 8. Review abandonment or removal of excavation support and protection system.
 - 9. Review adjacent building monitoring plan.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.
- B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.

2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Land surveyor.

B. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

1.6 CLOSEOUT SUBMITTALS

A. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.7 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility-serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner no fewer than 5 days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A36/A36M, ASTM A690/A690M, or ASTM A992/A992M.
- C. Wood Lagging: Per shoring plans and details.

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 that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.

3.2 INSTALLATION - GENERAL

- A. Locate excavation support and protection systems clear of permanent construction, so that construction and finishing of other work is not impeded.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

3.3 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation.
 - 1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
 - 2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
 - 3. Accurately align exposed faces of flanges per the SH drawings.
 - 4. Shaft excavation shall be performed every other pile. Allow concrete/CDF backfill a minimum of 12 hours to cure prior to drilling the adjacent piles. Contractor to avoid vibratory activities within 12'-0" of uncured pile.
- B. Install grouted vertical elements
 - 1. Grouted vertical elements should be installed per Budinger & Associates "STA Diesel Fuel UST Shoring Memorandum".
- C. Install wood lagging within flanges of soldier piles as excavation proceeds.
 - 1. Trim excavation as required to install lagging.
 - 2. Fill voids behind lagging with soil, and compact.

- D. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.4 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
 - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 MAINTENANCE

- A. Monitor and maintain excavation support and protection system.
- B. Prevent surface water from entering excavations by grading, dikes, or other means.
- C. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

3.6 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks weekly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.
 - 1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
 - 2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.7 REMOVAL AND REPAIRS

- A. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Recommendations provided in the Geotechnical Engineering Evaluation, dated February 5, 2015, prepared by GeoEngineers, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
 - 3. Pavement-marking paint.
- B. Work and materials shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, work and materials shall comply with the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.
- C. Related Sections:
 - 1. Section 024116 "Structure Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
 - 2. Section 312000 "Earth Moving" for subgrade preparation, grading, and base course.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. WSDOT: Washington State Department of Transportation.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.
- C. Material Test Reports: For each paving material, from a qualified testing agency.
- D. Field quality-control test reports, from a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Work and materials shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, work and materials shall comply with the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, or if rain is imminent or expected before time required for adequate cure. Surface and air temperatures shall conform to requirements of WSDOT Standard Specifications.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature in conformance with WSDOT Standard Specifications 8-22.
- C. Traffic Control: Maintain access for vehicular and pedestrian traffic as required.

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, in conformance with WSDOT Standard Specifications 9-03.8.
- C. Fine Aggregate: ASTM D 1073, in conformance with WSDOT Standard Specifications 9-03.8.
- D. Mineral Filler: ASTM D 242, in conformance with WSDOT Standard Specifications 9-03.8.
- E. Drainage Layer: Permeable Ballast, in conformance with WSDOT Standard Specifications 9-03.9(2).

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, in conformance with WSDOT Standard Specifications 9-02.
 - 1. On-site: 64-28
 - 2. Local Access Street: 64-28.
 - 3. Arterials: 70-28.
- B. Tack Coat: ASTM D 977 emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application, in conformance with WSDOT Standard Specifications 5-04.3(5) A.
- C. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the Environmental Protection Agency and acceptable to authorities having jurisdiction. Meet Washington State Department of Agriculture standards. Provide in granular, liquid, or wettable powder form. Notify Owner prior to application of herbicides.
- B. Sand: ASTM D 1073, in conformance with WSDOT Standard Specifications 9-03.8.
- C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications, in conformance with WSDOT Standard Specifications 9-33.
- D. Joint Sealant AASHTO M 324, Type IV, hot-applied, single-component, polymer-modified bituminous sealant, in conformance with WSDOT Standard Specifications 9-04.2.

- E. Pavement-Marking Paint: Comply with WSDOT Standard Specifications 9-34.2(3), Low VOC Waterborne Paint.
 - 1. Color: As indicated.
- F. Glass Beads: AASHTO M 247, Type 1, in conformance with WSDOT Standard Specifications 9-34.4.
- G. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 15-inch minimum length.
 - 2. Adhesive: As recommended by wheel-stop manufacturer for application to pavement.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Comply with WSDOT Standard Specification 5-04.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Testing Agency, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompress existing unbound-aggregate base course to form new subgrade.

- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving 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.
- C. Patching: Fill excavated pavements with hot-mix asphalt for full thickness of patch and, while still hot, compact flush with adjacent surface.

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.
- B. 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.
- C. Crack Sealing: Clean and fill cracks and joints 1/4 inch and greater in width per WSDOT Section 5-04.3(5) C.

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. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 3. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
 - 4. Comply with WSDOT Standard Specification 5-04.
- 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.
- 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. Transverse Joints: Comply with WSDOT Standard Specification 5-04.3(12) A.
 - 3. Longitudinal Joints: Comply with WSDOT Standard Specification 5-04.3(12) B.
 - 4. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 5. 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 with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Comply with WSDOT Standard Specification 5-04.3(10).
- 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 hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to specified density.
- 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.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated. Comply with WSDOT Standard Specification 5-04.

- B. Pavement Surface Smoothness: Comply with WSDOT Standard Specification 5-04.3(13).

3.8 PAVEMENT MARKING

- A. Apply pavement marking materials to clean, dry pavement surfaces according to WSDOT Standard Specification 8-22. Pavement markings shall comply with the Manual of Uniform Traffic Control Devices.

3.9 WHEEL STOPS

- A. Install wheel stops in bed of adhesive as recommended by manufacturer.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage and pay for a qualified testing agency to perform tests and inspections and to prepare test reports.
- B. Field quality control, testing, and inspections shall comply with WSDOT Standard Specifications.
- C. Replace and compact hot-mix asphalt where core tests were taken.
- D. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 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 milled materials to accumulate on-site.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

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 exterior cement concrete pavement for the following:
 - 1. Driveways.
 - 2. Curbs and gutters.
 - 3. Landscape edging and mow strips.
 - 4. Curb Ramps.
 - 5. Sidewalks.
- B. Work and materials shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, work and materials shall comply with the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.
- C. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
 - 2. Section 312000 "Earth Moving" for subgrade preparation, grading, and base course.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.
- B. WSDOT: Washington State Department of Transportation.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated. Include technical data and tested physical and performance properties.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with the specified requirements.
- D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- E. Field quality-control test reports, from a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius of 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Joint Dowel Bars: Comply with WSDOT Standard Specification 9-07.5.
- B. Tie Bars: Comply with WSDOT Standard Specification 9-07.6.
- C. Epoxy-Coated Steel Reinforcing Bars: Comply with WSDOT Standard Specification 9-07.3

2.3 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 I. Comply with WSDOT Standard Specification 9-01. Supplement with the following:
 - a. Fly Ash: AASHTO M295, Class C or F. Comply with WSDOT Standard Specification 9-23.9.
 - b. Ground Granulated Blast-Furnace Slag: AASHTO M 302, Grade 100 or 120. Comply with WSDOT Standard Specification 9-23.10.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate, uniformly graded. Provide aggregates from a single source. Comply with WSDOT Standard Specification 9-03.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Comply with WSDOT Standard Specification 9-03.1(2).
 - 3. Coarse Aggregate: Comply with WSDOT Standard Specification 9-03.1(4).
- C. Water: ASTM C 94/C 94M.
 - 1. Comply with WSDOT Standard Specification 9-25.
- D. Air-Entraining Admixture: ASTM C 260.
 - 1. Comply with WSDOT Standard Specification 9-23.6(1).
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material. Comply with WSDOT Standard Specification 9-23.6.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.4 CURING MATERIALS

- A. Curing Materials: Comply with WSDOT Standard Specification 9-23.

- B. Absorptive Cover: AASHTO M 182, Class 4, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry. Comply with WSDOT Standard Specification 9-23.5.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet. Comply with WSDOT Standard Specification 9-23.1.
- D. Water: Potable.
- E. Liquid Membrane –Forming Curing Compounds: Comply with WSDOT Standard Specification 9-23.2.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: Comply with WSDOT Standard Specification 9-04.1.

2.6 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Comply with WSDOT Standard Specification 9-34.2(3), Low VOC Waterborne Paint.
 - 1. Color: As indicated.
- B. Glass Beads: AASHTO M 247, Type 1, in conformance with WSDOT Standard Specification 9-34.4.

2.7 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 15-inch minimum length.
 - 2. Adhesive: As recommended by wheel-stop manufacturer for application to pavement.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 211.1 for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
 - 2. Comply with WSDOT Standard Specifications 5-05.3(1).
- B. Proportion mixtures to provide normal-weight concrete 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.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
1. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Comply with WSDOT Standard Specification 9-23.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Comply with WSDOT Standard Specification 6-02.3(4). Furnish batch certificates for each batch discharged and used in the Work.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Comply with WSDOT Standard Specification 6-02.3(4) B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll subgrade below concrete pavements to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Testing Agency, and replace with compacted backfill or fill as directed.
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted base surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated. Comply with WSDOT Standard Specification 5-05.3(8).
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints. Comply with WSDOT Standard Specification 5-05.3(8) C.
- 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. Comply with WSDOT Standard Specification 5-05.3(8) D.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Comply with WSDOT Standard Specification 5-05.3(8) A. Comply with WSDOT Standard Specification 5-05.3(8) B for sealing sawed contraction joints.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a radius in accordance with WSDOT Standard Plans. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
- F. Tie Bars and Dowel Bars: Comply with WSDOT Standard Specification 5-05.3(10).

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from base surface before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten base to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

- D. Comply with WSDOT Standard Specification 5-05 and ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. 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.
- F. Consolidate concrete according to WSDOT Standard Specification 5-05 and ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- G. Screed pavement surfaces with a straightedge and strike off.
- H. 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.
- I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- J. Cold-Weather Placement: Comply with WSDOT Standard Specification 5-05.3(14), ACI 306.1, and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. Do not use frozen materials or materials containing ice or snow.
 - 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- K. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

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 power-driven 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. Longitudinal tined finish shall comply with WSDOT Standard Specification 5-05.3(11).

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with WSDOT Standard Specification 5-05.3(14) and ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moist Curing: Comply with WSDOT Standard Specification 5-05.3(13) C.
 - 2. Moisture-Retaining-Cover Curing: Comply with WSDOT Standard Specification 5-05.3(13) B.
 - 3. Curing Compound: Comply with WSDOT Standard Specification 5-05.3(13) A.

3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of WSDOT Standard Specification 5-05, ACI 117 and as follows:
 - 1. Elevation: 1/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed 1/4 inch.
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 10. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

- A. Apply pavement marking materials to clean, dry pavement surfaces according to WSDOT Standard Specification 8-22. Pavement markings shall comply with the Manual of Uniform Traffic Control Devices.

3.10 WHEEL STOPS

- A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field quality control, testing, and inspections shall comply with WSDOT Standard Specifications.
- C. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least 1 composite sample for each 100-cu. yd. or fraction thereof of each concrete mix placed each day.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing.
- E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate requirements have not been met.
- F. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 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. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

- 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.

3.13 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.

END OF SECTION 321313

SECTION 334000 - STORM DRAINAGE UTILITIES

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 gravity-flow, nonpressure storm drainage outside the building, with the following components:
 - 1. Cleanouts.
 - 2. Drains.
 - 3. Precast concrete catch basins, inlets, and manholes.
 - 4. Precast concrete drywells.
- B. Work and materials shall comply with the requirements and standards of the authorities having jurisdiction. If a standard is not provided by the authorities having jurisdiction, work and materials shall comply with the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction as jointly promulgated by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association.
- C. The Contractor shall coordinate points of connection to assure that inverts and alignment match indicated points on the plans.

1.3 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.
- C. CPPA: Corrugated Polyethylene Pipe Association.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: At least equal to system test pressure in conformance with authorities having jurisdiction requirements. Pipe joints shall be at least soiltight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For the following:
 - 1. Manholes: Include plans, elevations, sections, details, and frames and covers.
 - 2. Catch Basins and Drywells: Include plans, elevations, sections, details, and frames, covers, and grates.
- C. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes and other structures according to manufacturer's written rigging instructions.
- D. Handle catch basins and inlets according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Architect's written permission.
- B. Site Information: Field verify existing conditions, research public records, and locate existing utilities prior to construction. Verify the location, elevation, and size of existing storm drain lines before proceeding with construction activities, including points of connection and utility crossings. Notify the Architect of any discrepancies prior to proceeding.

1.8 PROJECT RECORD DOCUMENTS

- A. As-Built Documents: Accurately record location of pipe runs, connections to existing pipes and cleanouts:
 - 1. Location shall be noted off identified project bench marks or staked property corners.
- B. Identify and describe unexpected variations of subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.2 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 10 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 48: AASHTO M 294M, Type S, with smooth waterway for coupling joints
- C. Piping in subparagraph below is available in NPS 12 to NPS 48. Joints are coupling type.
 - 1. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.3 PVC PIPE AND FITTINGS

- A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.4 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.5 CLEANOUTS

- A. Cleanouts: Comply with the City of Spokane Standard Plan Z-114 and shall have a cast iron ring and cover.
 - 1. Removable stopper is required to prevent the passage of dirt or water.

2.6 MANHOLES

- A. Standard Precast Concrete Manholes:
 - 1. Comply with City of Spokane Standard Plan Z-101 (Manhole Type I-48).

B. Manhole Rings and Covers:

1. Comply with City of Spokane Standard Plan B-112. Cover shall have the word "STORM" cast into the cover

2.7 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Comply with City of Spokane Standard Plans. Type and location shown on plans.

2.8 INLETS

- A. Curb Drop Inlet: Comply with City of Spokane Standard Plan F-109.

2.9 DRYWELLS

- A. Precast Drywells: Comply with City of Spokane Standard Plan B-102C and B-102D.
- B. Precast Drywell Details: Comply with The City of Spokane Standard Plan B-102C and B-102D.
- C. Drywell Frame and Grates: Comply with City of Spokane Standard Plan B-112 or B-113. Install grate or solid cover as indicated on the plans. Solid covers shall bear the word "STORM".

2.10 DRAIN ROCK

- A. Drain Rock for Drywells: Washed gravel graded from 1" to 3" with a maximum of 5% passing the U.S. No. 200 screen, as measured by weight. A maximum of 10% of the aggregate, as measured by weight, may be crushed or fractured rock. The remaining 90% shall be naturally occurring unfractured material.

2.11 FILTER FABRIC

- A. Filter Fabric: Non-woven geotextile meeting the requirements of WSDOT section 9-33.2(1) for underground drainage geotextile, moderate survivability, class A.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure drainage piping, unless otherwise indicated. Use where required to join piping and no other appropriate method is specified.
- B. Gravity-Flow, Nonpressure Drainage Piping: Use the following pipe materials for each size range:
 - 1. NPS 4 to NPS 15: PVC sewer pipe and fittings, gaskets, and gasketed joints.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes, catch basins, or other specified drainage structures for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 - 2. Install piping with 36-inch minimum cover, unless otherwise indicated.
 - 3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

3.4 PIPE JOINT CONSTRUCTION

- A. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

- B. Join gravity-flow, nonpressure drainage piping according to the following:
 - 1. Join corrugated PE piping according to CPPA 100 and the following:
 - a. Use soiltight couplings for Type 2, soiltight joints.
 - 2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
 - 3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install cleanouts complete with appurtenances and accessories indicated. Install cleanouts according to the requirements and standards of the City of Spokane. Install piping so cleanouts open in direction of flow in storm pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete cylinder, 18-inches in diameter by 12-inches deep.
- C. Set cleanout frames and covers in pavement with tops flush with pavement surface.

3.6 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated. Install manholes according to the requirements and standards of the City of Spokane.
- B. Install precast concrete manhole sections according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.
- C. Install catch basins, complete with appurtenances and accessories indicated. Install catch basins according to the requirements and standards of the City of Spokane.

3.8 DRYWELL INSTALLATION

- A. Excavate hole to diameter of at least 12 inches greater than outside of drywell. Do not extend excavation into ground-water table.

- B. Install filter fabric in the excavation, making sure to overlap the ground surface.
- C. Install precast, concrete drywells in the excavation according to the following:
 - 1. Assemble barrels to depth indicated.
 - 2. Install cone section on top of barrels.
 - 3. Extend riser rings to height where top of cover/grate will be at the "RIM" elevation.
 - 4. Extend effluent inlet pipe into cone or barrel sections and terminate nearly flush with the inside wall of the structure.
 - 5. Backfill around outside of barrel and inside the filter fabric with drain rock to top level of barrel.
 - 6. Fold filter fabric over the top of the drain rock.
 - 7. Install concrete slab (if required).
 - 8. Install cover/grate on top of risers.

3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

3.10 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's storm building drains.
- B. Make connections to drainage piping and structures.
 - 1. Make connections according to the requirements and standards of the City of Spokane.
 - 2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.11 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

- A. Inspect and test storm drainage improvements according to requirements of authorities having jurisdiction.

- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) 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.
- C. 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.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334000