PROJECT MANUAL
for
REEDSPORT STATION 7

Seismic Retrofit and Remodel
146 N 4th St
Reedsport, OR 97467

4-19-23
Job Number: G-1468-21

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DOCUMENT 000115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled REEDSPORT FIRE STATION 7, 95% CONSTRUCTION DOCUMENTS | BID / PERMIT SET, dated 01-24-23, as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

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DOCUMENT 001113 - ADVERTISEMENT FOR BIDS

1.1 PROJECT INFORMATION

A. Notice to Bidders: **Qualified** bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.

1. Regulatory Requirements: ORS 279C.335 Competitive bidding requirement shall govern submittal, opening, and award of bids.

B. Project Identification: Reedsport Station 7

1. Project Location: 146 N 4th ST. Reedsport, OR 97467

C. Owner:
City of Reedsport
451 Winchester Ave
Reedsport, OR 97467

1. Owner's Representative:
Matthew Crawford
Project Manager
ZCS Engineering and Architecture, Inc.
office: 503-695-2205
2. Architect:
Jacob Zander, AIA NCARB
ZCS Engineering and Architecture, Inc.
office: 503-659-2205

D. Project Description: The scope of this project is the seismic rehabilitation and remodel of Fire Station 7 in Reedsport, OR. This project is funded by a seismic retrofit grant through the state of Oregon Infrastructure Finance Authority as well as funds from the owner for remodel related scope of work. The drawings indicate where owner funds are to be used for budgeting purposes. All construction related bids shall separate seismic related scope of work from remodel scope of work as indicated in the construction documents.

Seismic Rehabilitation Scope

The retrofit will be accomplished by means of adding lateral force resisting elements where necessary, by ensuring a proper load path to the foundation elements. The G.C. is responsible for all aspects of construction necessary for the completion of all work incidental to the work illustrated in this plan set.

The seismic rehabilitation of this building is funded by a grant awarded to the City of Reedsport by the Infrastructure Finance Authority of Oregon Business Development Department as part of their seismic rehabilitation objective of immediate occupancy for the fire station as outlined in the American Society of Engineers' 'Seismic rehabilitation of existing buildings' (ASCE 41-17). The rehabilitation objective is defined as:

"*structural performance level immediate occupancy means the post-earthquake damage state in which only very limited structural damage has occurred. The basic vertical- and lateral-force resisting systems of the building retain nearly all of their pre-earthquake strength and stiffness. The risk of life threatening injury as a result of structural damage is very low and although some minor structural repairs may be appropriate, these would generally not be required prior to re-occupancy*."

Remodel Scope (Owner funded)

The scope of the remodel consists of expanding the existing dispatch area by removing one of the apparatus bays. The orientation of the apparatus bays will be rotated 90 degrees to exit onto Winchester Ave.

The G.C. is responsible for all aspects of construction necessary for the completion of all work incidental to the work illustrated in the construction documents.

E. Project Budget:

1. Construction cost range for seismic retrofit related scope of work is anticipated to be under $1,845,160.00

2. Construction cost range for Owner related scope of work is anticipated to be under $500,000.00

F. Construction Contract: Bids will be received for the following Work:

1. General Contract (all trades).

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Bid Date: May 18th
2. Bid Time: **2:00 p.m.**, local time.
3. Location: Reedsport City Hall, 451 Winchester Avenue, Reedsport, OR 97467

B. Bids will be thereafter publicly opened and read aloud.

1.3 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of **60** days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID MEETING

A. Prebid Meeting: A mandatory Prebid meeting for all bidders will be held at 146 N 4th St, Reedsport, OR 97467on **May 3rd** at **11:00 a.m.**,local time. Prospective prime bidders are **required to** attend.

1.5 DOCUMENTS

A. Online Procurement and Contracting Documents: Obtain access after April 26th, 2023 by contacting Troy Shafranek, troys@zcsea.com. Online access will be provided to **prime bidders only**.

1.6 TIME OF COMPLETION **AND LIQUIDATED DAMAGES**

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. **Work is subject to liquidated damages.**

1.7 BIDDER'S QUALIFICATIONS

A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. **A Performance Bond, separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.**

B. Minimum pre-qualifications for bidders: Certain minimum qualifications have been established for the proposers to be considered for the contracts described in the Work.

1. Bidders shall have five or more years' continuous experience as a current construction firm that has completed at least two other projects of comparable size, cost, and complexity during that time.
2. Bidders shall be capable of providing a 100% performance bond and 100% labor and material bond for the project.
3. Bidders shall have key personnel available for the time and magnitude of the project throughout its duration. Key personnel assigned to the project shall maintain their assigned position throughout the project unless requested to be removed by the Owner or unless otherwise approved by the Owner.
4. Due to the fast-paced timeline associated with this Work, proposers may self-certify that they meet these requirements by filling out the enclosed prequalification statement. Prequalification is mandatory. Proposals that do not contain the signed Prequalification Statement will be deemed nonresponsive and will be disqualified from further consideration.

1.8 NOTIFICATION

A. This Advertisement for Bids document is issued by Matthew Crawford, Project Manager, ZCS Engineering & Architecture, Inc.

END OF DOCUMENT 001113

DOCUMENT 002213 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders a copy of which is bound in this Project Manual."
2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.3 BIDDER'S REPRESENTATIONS

A. The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. The Bidder is a properly licensed Contractor according to the laws and regulations of the authority having jurisdiction and meets qualifications indicated in the Procurement and Contracting Documents.

C. The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

D. Prevailing wage rates for public works contracts in Oregon are required for this Project. No proposal will be received or considered by the Owner unless the proposal contains a statement that the firm will comply with the provisions of ORS 279C.800 – 279C.870 or 40U.S.C. 276a.

1.4 BIDDING PROCEDURES

A. Preparation of Bids:
1. Printable electronic Bid Forms and related documents are available via email request to troys@zcsea.com.
2. Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

B. Submission of Bids:

Include Bidder's Contractor License Number applicable in Project jurisdiction, project name, Attn: Deanna Schafer on the face of the sealed bid envelope.

C. Modification or Withdrawal of Bids:
1. Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.
2. Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.

1.5 CONSIDERATION OF BIDS

A. Rejection of Bids:
1. Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.

1.6 PERFORMANCE BOND AND PAYMENT BOND

A. Bond Requirements:
1. Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.
   a. AIA Document A312 Performance Bond and A312 Payment Bond is bound in this Project Manual.

B. Time of Delivery and Form of Bonds:
1. The Bidder shall deliver the required bonds to Owner no later than **10** days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.

1.7 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. AIA Document A105™–2017, Standard Short Form of Agreement Between Owner and Contractor

B. EXECUTION OF THE CONTRACT
1. Subsequent to the Notice of Intent to Award, and within **10** days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through **Architect**, in such number of counterparts as Owner may require.
2. Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date that the Bidder is obligated to deliver the executed Agreement and required bonds to Owner.
4. In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

END OF DOCUMENT 002213

DOCUMENT 002600 - PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

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

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to **Architect**. Procurement Substitution Request must be made in writing **by prime contract Bidder only** in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 5 days prior to date of bid opening.
2. Submittal Format: Submit Procurement Substitution Request, using format provided below.

a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.

b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.

2) Copies of current, independent third-party test data of salient product or system characteristics.

3) Samples where applicable or when requested by Architect.

4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

6) Research reports, where applicable, evidencing compliance with building code in effect for Project..

7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

DOCUMENT 003113 - PRELIMINARY SCHEDULES

1.1 PROJECT SCHEDULE

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but do not affect Contract Time requirements. This Document and its attachments are not part of the Contract Documents.

B. Available Project information includes the following:

1. Seismic Retrofit Project Schedule.
   a. Substantial completion date no later than: 12/30/2023. No extensions permitted.
2. Remodel (Owner Funded) Project Schedule.
   a. Substantial completion date: 5/31/24.

C. Related Requirements:

1. **Document 004113 "Bid Form - Stipulated Sum (Single-Prime Contract)"**for Contract Time.

END OF DOCUMENT 003113

DOCUMENT 003119 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Photographic report of existing conditions that includes photographic documentation on existing conditions, is available **as appendix A to this Document**.

C. Related Requirements:

1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Document 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.
3. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003119

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. An existing asbestos and lead report for Project, prepared by Arcadia Environmental, dated Feb. 22nd, 2022, is available for viewing **as appendix C to this Document**.

C. Related Requirements:

1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Document 003119 "Existing Condition Information" for information about existing conditions that is made available to bidders.
3. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003126

DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for Project, prepared by Foundation Engineering, Inc., dated Jan. 8th, 2023, is available for viewing **as appendix B to this Document**.

1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

C. Related Requirements:

1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Document 003119 "Existing Condition Information" for information about existing conditions that is made available to bidders.
3. Document 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

END OF DOCUMENT 003132

DOCUMENT 003143 - PERMIT APPLICATION

1.1 PERMIT APPLICATION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.

B. Permit Application: The building permit for Project has been approved. The Condition Approval Letter is **available for viewing as Appendix 'D' attached to this document.**

END OF DOCUMENT 003143

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Reedsport Station 7 Seismic Retrofit.

C. Project Location: 146 N 4th ST. Reedsport, OR 97467

D. Owner: City of Reedsport

E. Engineer: ZCS Engineering & Architecture, Inc.

F. Engineer Project Number: G-1468-21

1.2 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by ZCS Engineering & Architecture, Inc. having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. Seismic Retrofit Scope of Work

   a. _____Dollars

   ($_____).

2. Remodel (Owner funded) Scope of Work

   a. _____Dollars

   ($_____).

1.3 BID BOND

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within **10** days after a written Notice of Award, if offered within 20 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. _____Dollars ($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 SUBCONTRACTORS AND SUPPLIERS

A. ORS 279C.370 requires that "bidder shall submit to the public contracting agency a disclosure of the first-tier subcontractors that: (A) will be furnishing labor or will be furnishing labor and materials in connection with the public improvement; and (B) will have a contract value that is equal to or greater than five percent of the total project bid or$15,000, whichever is greater, or $350,000 regardless of the percentage of the total project bid." The Bidder must disclose their first-tier subcontracts either in its Bid submission or within two (2) working hours after the date and time of the deadline when bids are due.

1. See attached First-Tier Subcontractor Disclosure Form.

1.5 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete the Work by the date specified under Section 003113 Preliminary Schedule.

1.6 ACKNOWLEDGMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated _____.
2. Addendum No. 2, dated _____.
3. Addendum No. 3, dated _____.
4. Addendum No. 4, dated _____.

1.7 BID SUPPLEMENTS

A. The following supplements are a part of this Bid Form and are attached hereto.

1. Bid Form Supplement - Alternates.
2. Bid Form Supplement - Bid Bond Form (AIA Document A310-2010).
3. First-Tier Subcontractor Disclosure Form.

1.8 CONTRACTOR'S LICENSE

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

1.9 SUBMISSION OF BID

A. Respectfully submitted this ____ day of _____, 2023

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

F. Street Address:_____.

G. City, State, Zip:_____.

H. Phone:_____.

I. License No.:_____.

J. Federal ID No.:_____(Affix Corporate Seal Here).

END OF DOCUMENT 004113

DOCUMENT 004313 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A312-2010 "Bid Bond" is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

END OF DOCUMENT 004313

DOCUMENT 004323 - ALTERNATES FORM BID INFORMATION

A. Bidder: _____.

B. Prime Contract: _____.

C. Project Name: Reedsport Station 7

D. Project Location: 146 N 4th St, Reedsport, OR

E. Owner: City of Reedsport

F. Architect: ZCS Engineering & Architecture, Inc.

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

1.3 DESCRIPTION

A. The undersigned Bidder proposes the amount below be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.

B. If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."

C. If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."

D. The Bidder shall be responsible for determining from the Contract Documents the affects of each alternate on the Contract Time and the Contract Sum.

E. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within [**60**] days of the Notice of Award unless otherwise indicated in the Contract Documents.

F. Acceptance or non-acceptance of any alternates by the Owner shall have no affect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

1.4 SCHEDULE OF ALTERNATES

A. Alternate No. 1; Composite Wood & Steel Fence

1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

2. _____ Dollars ($_____).

B. Alternate No. 2; Cedar wood fence.

1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

2. _____ Dollars ($_____).

C. Alternate No. 3; Door Hardware Deduct

1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

2. _____ Dollars ($_____).

1.5 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this ____ day of _____, <**Insert year**>.

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

END OF DOCUMENT 004323

DOCUMENT 004393 - BID SUBMITTAL CHECKLIST

1.1 BID INFORMATION

A. Bidder: _____.
B. Project Name: Reedsport Station 7 Seismic Retrofit.
C. Project Location: 146 N 4th ST. Reedsport, OR 97467.
D. Owner: City of Reedsport.
E. Architect: ZCS Engineering & Architecture, Inc.

1.2 BIDDER'S CHECKLIST

A. In an effort to assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements.

B. Attach this completed checklist to the outside of the Submittal envelope.

1. _____Used the Bid Form provided in the Project Manual.
2. _____Prepared the Bid Form as required by the Instructions to Bidders.
3. _____Indicated on the Bid Form the Addenda received.
4. _____Attached to the Bid Form: Bid Supplement Form - Alternates.
5. _____Attached to the Bid Form: Bid Bond OR a certified check for the amount required.
6. _____Bid envelope shows name and address of the Bidder.
7. _____Bid envelope shows the Bidder's Contractor's License Number.
8. _____Bid envelope shows name of Project being bid.
9. _____Bid envelope shows time and day of Bid Opening.
10. _____Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
11. _____Verified that the Bidder can provide Certificates of Insurance in the amounts indicated.
12. _____Prequalification Statement.
13. _____Statement of Assurances
14. _____Demonstrated Drug Testing Program
15. _____First-Tier Subcontractor Disclosure Form

END OF DOCUMENT 004393

ATTACHMENT A
PREQUALIFICATION STATEMENT

PROJECT TITLE: **Reedsport Station 7**

PROJECT LOCATION: **Reedsport, Oregon**

Proposers must meet certain minimum Prequalification Criteria in order to be eligible to submit proposals. In the interest of expediting the contract awards and reducing preparation expense to potential Proposers, the Owner will allow Proposers to self-certify that they meet the following pass/fail Prequalification Criteria and are therefore eligible to propose on this procurement:

Bonding Capacity: The Proposer must be capable of providing, for the full term of the project and one year after completion, a 100% Performance Bond and 100% Payment Bond for a project valued up to 100% of the construction costs.
Do you meet these criteria ( ) Yes or ( ) No ?

Specialized Experience: The Proposer must have completed at least two projects of similar or greater scope, which have been contracted in the Northwest United States (Alaska, Washington, Oregon, Idaho, Montana, Northern California) within the last five years.
Do you meet these criteria ( ) Yes or ( ) No ?

Availability: The Proposer's anticipated work in terms of time and magnitude for the time period **June 2023 through March 2024,** must accommodate this project, including availability of key personnel for this project.
Do you meet these criteria ( ) Yes or ( ) No ?

Licenses: The Proposing firm and its subcontractors must be licensed to do business in the State of Oregon. This means that the firms must have current Oregon Construction Contractors Board registration.
Do you meet these criteria ( ) Yes or ( ) No ?

If not, how do you propose conforming to this requirement?

_____
Signature of authorized person

_____
Title of authorized person

END OF DOCUMENT

ATTACHMENT B
STATEMENT OF ASSURANCES

PROJECT TITLE: **Reedsport Station 7**
PROJECT LOCATION: **Reedsport, Oregon**

1) The undersigned attests that he/she has the authority and/or responsibility to represent the organization submitting this Bid and in this Statement of Assurances.
2) The Firm understands that this Bid is considered an integral part of the Bid process, and RFP terms shall be binding on the Firms. Failure of the successful Firm to accept these obligations in a Contract as authorized by the Statement of Assurances may result in cancellation of an award.
3) The proposer accepts all terms and conditions contained in Project Manual, and any modifications will be made part of the contract documents. It is understood that all bids become part of the public file on this matter, unless limited and specific information is identified and exempt under Oregon Public Records Law.
4) The undersigned understands that any false or substantially incorrect statement in the Bid or Statement of Assurances may disqualify this Proposal from further consideration or any further Contract.
5) Firm understands that in submitting a Bid, Firm agrees to comply with all applicable federal, state, and local laws, regulations and requirements related to the Bid and performance of any resulting Contract, including but not limited to those referenced in the Project Manual.
6) The undersigned acknowledges receipt of and agrees to be bound by addenda numbered _ through _____, inclusive and any additional addenda issued until intent of Award has been posted.
7) The Firm certifies that the Contractor can meet the insurance requirements outlined in the proposed Contract and that the Firm understands that such coverage must be kept active during the entire term of the Contract, if selected. Contractor shall commence no work under this contract until the Contractor and every subcontractor has a public works bond filed with the Construction Contractors Board in accordance with ORS 279C.830 and all other bonding and insurance requirements have been met and a Notice to Proceed has been issued.
8) Non-Collusion: The undersigned certifies that:
    a) This bid has been arrived at independently and is being submitted without collusion with any other vendor of materials, supplies, equipment, or services to limit independent bidding or competition, and
    b) The contents of this bid have not been communicated by the undersigned or its employees or agents to any person not an employee or agent of the undersigned or its surety on any bond furnished with the bid and will not be communicated to such person prior to the official opening of the bid.
9) The Contractor is a resident Contractor _____ or nonresident Contractor _____ of the State of Oregon as defined in ORS 279A.120.
10) The Undersigned certifies that they are in compliance with requirements for construction contractors or landscape contractors and are registered and bonded with the State of Oregon Construction Contractors Board as follows:
    (a) Registration NO._____ Expiration Date:_____

11) The Undersigned agrees, if awarded a contract, that they will comply with the provisions of **ORS 279C.800 – 279C.870** or **Davis-Bacon 40 U.S.C 3141 et seq** as applicable, pertaining to the payment of the prevailing wage rates. By signing below the Undersigned agrees that he/she affirmatively acknowledges the following:

    (a) Compliance with ORS 279C.838 and 40 USC 3141 et seq (if both state and federal Davis-Bacon applies. IF the state rate is higher, the contractor and every sub-contractor shall pay at least the state rate); or compliance with ORS 279C.840 (Davis-Bacon does not apply, and only the state prevailing rate of wage is to be paid); or compliance with 40 USC 3141 et seq (only Davis-Bacon rate of wage applies, or is the highest one for all of the job categories).

12) In the event the Proposer is awarded the contract and fails to complete the work within the time frame specified, including extensions granted, liquidated damages shall be paid to the Owner as outlined in the General Conditions attached in the Contract.

13) By signing this page Contractor hereby certifies that s/he has not discriminated against minority, women, or emerging small business enterprises in obtaining any required sub-contracts, and Contractor hereby certifies that to the best of Contractor's knowledge, s/he is in compliance with all Oregon Tax laws described in ORS 305.380(4).

I, the undersigned, have read and thoroughly understand the requirements, special provisions, Instructions to Bidders, and all other Conditions of the Project Manual issued by the **City of Reedsport** for the **Reedsport Station 7** project. I have read and understand the entire contract provisions included in the Project Manual and agree to abide by and fulfill the requirements thereof if awarded the Contract as a result.

Firm Name:_____

Address:_____

Phone:_____ **Fax:**_____

Authorized Representative's Signature:_____

Type or Print Name:_____

Representative's Title:_____

Date:_____

Federal Business I.D. No._____

NOTARY:

Subscribed and sworn before me this _____ **day of** _____**, 20**_____**.**

_____ **Notary Public for the State of** _____**.**

My commission expires _____**.**

END OF DOCUMENT

ATTACHMENT C
DEMONSTRATED DRUG TESTING PROGRAM

PROJECT TITLE: **Reedsport Station 7**

PROJECT LOCATION: **Coquille, Oregon**

ORS 279C.505 requires that all public contracts contain a provision requiring contractors to demonstrate that an employee drug-testing program is in place. Proposer is therefore required to certify that Proposer has an employee drug-testing program in place that applies to all employees and will maintain a drug testing program at all times during the performance of the Contract awarded. Failure to maintain a program shall constitute a material breach of contract.

Proposer states that the Proposer:

CHECK ONE: ( ) Does ( ) Does not Comply with the following:

Proposer has a drug-testing program in place and in compliance with ORS 279C.505(2) which applies to all employees. Proposer shall maintain a drug-testing program at all times during the performance of the Contract awarded. Failure to maintain such a program shall constitute a material breach of contract.

I, the undersigned, a duly authorized representative of the Proposer, hereby certify that the answers to the foregoing questions and all statements therein contained are true and correct.

_____

Signature of the authorized Representative

Printed Name:_____

Firm:_____

Representative's Title or Position:_____

Telephone No:_____

END OF DOCUMENT

ATTACHMENT D
STATE OF OREGON FIRST TIER SUBCONTRACTOR DISCLOSURE REQUIREMENTS

STATE OF OREGON FIRST TIER SUBCONTRACTOR DISCLOSURE FORM TO BE SUBMITTED BY ALL BIDDERS NOT LATER THAN 4:00 P.M. THE DAY THE BID IS DUE

ORS 279C.370 requires that "bidder shall submit to the public contracting agency a disclosure of the first-tier subcontractors that: (A) will be furnishing labor or will be furnishing labor and materials in connection with the public improvement; and (B) will have a contract value that is equal to or greater than five percent of the total project bid or $15,000, whichever is greater, or $350,000 regardless of the percentage of the total project bid."

The disclosure of first-tier subcontractors applies to public improvements with a contract value of more than $100,000.

The Bidder must disclose the following information about their first-tier subcontracts either in its Bid submission or within two (2) working hours after the date and time of the deadline when bids are due:

1. The subcontractor's name
2. Dollar value
3. The category of work that the subcontractor would be performing.

If the bidder will not be using any subcontractors that are subject to the above disclosure requirements, the bidder is required to indicate **"NONE"** on the accompanying form.

Failure to submit this form by the disclosure deadline will result in a non-responsive bid. A non-responsive bid will not be considered for award.

Note to Contractors who are not the low bidder:

If apparent low bidder is disqualified or otherwise not awarded the contract and the next low bidder failed to submit the disclosure form within two (2) hours after the date and time of the deadline when bids were due, that bidder will be ineligible to receive award of the contract.

STATE OF OREGON
FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM

This form must be submitted at the location specified in the Invitation to Bid within two (2) working hours after the date and time of the deadline when the bids are due.
List below the name of each subcontractor that will be furnishing labor or labor and materials and that is required to be disclosed by ORS 279C.370, the dollar value of the subcontract and the category of work that the subcontractor will be performing.

*Enter "**NONE**" if there are no subcontractors that need to be disclosed.*
(ATTACH ADDITIONAL SHEETS IF NEEDED)

Project Name: Reedsport Station 7

Bid Number: **NA_____Bid Closing - Date: May 18th, 2023 Time: 2:00 PM**

SUBCONTRACTOR NAME (Please Print)	**DOLLAR VALUE**	**CATEGORY/DIVISION OF WORK** (Painting, electrical, landscaping, etc.)
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Name	**$**	
Failure to submit this form by 4:00 p.m. on the day of the bid opening will result in a non-responsive bid. **A non-responsive bid will not be considered for award.**		

Form submitted by (Bidder's Name):_____

Contact Name:_____Phone No.:_____

DRAFT

AIA® Document A701® – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

«Reedsport Station 7»
«146 N 4th St, Reedsport, OR 97467»
« »

THE OWNER:
(Name, legal status, address, and other information)

« City of Reedsport »« »
« 451 Winchester Ave
Reedsport, OR 97467 »
« »
« »

THE ARCHITECT:
(Name, legal status, address, and other information)

« Jake Zander
ZCS Engineering & Architecture
524 Main St, Ste 2
Oregon City, OR 97405 »« »
« »
« »
« »

TABLE OF ARTICLES

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

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

« TO obtain a copy of the bidding documents email troys@zcsea.com»

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper

documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

« For clarification, interpretations of Bidding Documents email troys@zcsea.com »

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

« Addenda will be delivered to plan holders via email. »

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

« AIA Document A310 attached to this document. Bid security shall be submitted with each bid in the amount of 10 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to wave information and irregularities. »

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning« »days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

«Bids shall be submitted using Document 004113 Bid Form »

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

« »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids
Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)
§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION
§ 6.1 Contractor's Qualification Statement
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability
A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals
§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- **.1** a designation of the Work to be performed with the Bidder's own forces;
- **.2** names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- **.3** names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND
§ 7.1 Bond Requirements
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

« »

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A105™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

« »

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

« »

DRAFT

AIA® Document A105® – 2017

Standard Short Form of Agreement Between Owner and Contractor

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« City of Reedsport »
« 451 Winchester Ave
Reedsport, OR 97467 »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«Reedsport Station 7»
«146 N 4th St, Reedsport, OR 97467»
« »

The Architect:
(Name, legal status, address and other information)

« Jake Zander, AIA NCARB »« »
« ZCS Engineering & Architecture, Inc»
« 541 W Main St, Ste 2 »
« Oregon City, OR 97405»

The Owner and Contractor agree as follows.

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

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

DRAFT

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TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contractor shall complete the Work described in the Contract Documents for the Project. The Contract Documents consist of

.1 this Agreement signed by the Owner and Contractor;

.2 the drawings and specifications prepared by the Architect, dated « 01-24-23 », see Division 00 01 15 List of Drawings Sheets.

.3 addenda prepared by the Architect as follows:

Number	Date	Pages

.4 written orders for changes in the Work, pursuant to Article 10, issued after execution of this Agreement; and

.5 other documents, if any, identified as follows:

Project Specifications and Appendices as outlined in the Table of Contents in the Project Manual.

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 2.1 The Contract Time is the number of calendar days available to the Contractor to substantially complete the Work.

§ 2.2 Date of Commencement:
Unless otherwise set forth below, the date of commencement shall be the date of this Agreement.
(Insert the date of commencement if other than the date of this Agreement.)

« »

§ 2.3 Substantial Completion:
Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion, as defined in Section 12.5, of the entire Work:
(Check the appropriate box and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement.

[« »] By the following date: « See Document 00 31 13 Preliminary Schedules »

ARTICLE 3 CONTRACT SUM

§ 3.1 The Contract Sum shall include all items and services necessary for the proper execution and completion of the Work. Subject to additions and deductions in accordance with Article 10, the Contract Sum is:

« » ($ « »)

§ 3.2 For purposes of payment, the Contract Sum includes the following values related to portions of the Work:
(Itemize the Contract Sum among the major portions of the Work.)

Portion of the Work	Value

§ 3.3 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and hereby accepted by the Owner:
(Identify the accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

§ 3.4 Allowances, if any, included in the Contract Sum are as follows:
(Identify each allowance.)

Item	Price

§ 3.5 Unit prices, if any, are as follows:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

ARTICLE 4 PAYMENTS

§ 4.1 Based on Contractor's Applications for Payment certified by the Architect, the Owner shall pay the Contractor, in accordance with Article 12, as follows:
(Insert below timing for payments and provisions for withholding retainage, if any.)

« »

§ 4.2 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate below, or in the absence thereof, at the legal rate prevailing at the place of the Project.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 5 INSURANCE

§ 5.1 The Contractor shall maintain the following types and limits of insurance until the expiration of the period for correction of Work as set forth in Section 14.2, subject to the terms and conditions set forth in this Section 5.1:

§ 5.1.1 Commercial General Liability insurance for the Project, written on an occurrence form, with policy limits of not less than « one million» ($ « 1,000,000 ») each occurrence, «two million » ($ «2,000,000 ») general aggregate, and « three million » ($ «3,000,000 ») Excess or Umbrella Liability general aggregate and each occurrence.

§ 5.1.2 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « one million» ($ «1,000,000») per accident, for each bodily injury, death of any person, and property damage arising out of the ownership, maintenance, and use of those motor vehicles along with any other statutorily required automobile coverage.

§ 5.1.3 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided that such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 5.1.1 and 5.1.2, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 5.1.4 Workers' Compensation at statutory limits. Comply with ORS 656.017.

§ 5.1.5 Employers' Liability with policy limits not less than « Statutory » State, « Statutory » Federal, and « five hundred thousand » ($ « 500,000 ») employer's liability.

§ 5.1.6 The Owner will provide builder's risk insurance to cover the total value of the entire Project on a replacement cost basis.

§ 5.1.7 Other Insurance Provided by the Contractor
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ 5.2 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance and shall provide property insurance to cover the value of the Owner's property. The Contractor is entitled to receive an increase in the Contract Sum equal to the insurance proceeds related to a loss for damage to the Work covered by the Owner's property insurance.

§ 5.3 The Contractor shall obtain an endorsement to its Commercial General Liability insurance policy to provide coverage for the Contractor's obligations under Section 8.12.

§ 5.4 Prior to commencement of the Work, each party shall provide certificates of insurance showing their respective coverages.

§ 5.5 Unless specifically precluded by the Owner's property insurance policy, the Owner and Contractor waive all rights against (1) each other and any of their subcontractors, suppliers, agents, and employees, each of the other; and (2) the Architect, Architect's consultants, and any of their agents and employees, for damages caused by fire or other causes of loss to the extent those losses are covered by property insurance or other insurance applicable to the Project, except such rights as they have to the proceeds of such insurance.

ARTICLE 6 GENERAL PROVISIONS

§ 6.1 The Contract

The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written modification in accordance with Article 10.

§ 6.2 The Work

The term "Work" means the construction and services required by the Contract Documents, and includes all other labor, materials, equipment, and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

§ 6.3 Intent

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.

§ 6.4 Ownership and Use of Architect's Drawings, Specifications and Other Documents

Documents prepared by the Architect are instruments of the Architect's service for use solely with respect to this Project. The Architect shall retain all common law, statutory, and other reserved rights, including the copyright. The Contractor, subcontractors, sub-subcontractors, and suppliers are authorized to use and reproduce the instruments of service solely and exclusively for execution of the Work. The instruments of service may not be used for other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Architect.

§ 6.5 Electronic Notice

Written notice under this Agreement may be given by one party to the other by email as set forth below.
(Insert requirements for delivering written notice by email such as name, title, and email address of the recipient, and whether and how the system will be required to generate a read receipt for the transmission.)

« »

ARTICLE 7 OWNER

§ 7.1 Information and Services Required of the Owner

§ 7.1.1 If requested by the Contractor, the Owner shall furnish all necessary surveys and a legal description of the site.

§ 7.1.2 Except for permits and fees under Section 8.7.1 that are the responsibility of the Contractor, the Owner shall obtain and pay for other necessary approvals, easements, assessments, and charges.

§ 7.1.3 Prior to commencement of the Work, at the written request of the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence.

§ 7.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work until the correction is made.

§ 7.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies, correct such deficiencies. In such case, the Architect may withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the cost of correction, provided the actions of the Owner and amounts charged to the Contractor were approved by the Architect.

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

§ 7.4.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project.

§ 7.4.2 The Contractor shall coordinate and cooperate with the Owner's own forces and separate contractors employed by the Owner.

ARTICLE 8 CONTRACTOR

§ 8.1 Review of Contract Documents and Field Conditions by Contractor

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

§ 8.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. Before commencing activities, the Contractor shall (1) take field measurements and verify field conditions; (2) carefully compare this and other information known to the Contractor with the Contract Documents; and (3) promptly report errors, inconsistencies, or omissions discovered to the Architect.

§ 8.2 Contractor's Construction Schedule

The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work.

§ 8.3 Supervision and Construction Procedures

§ 8.3.1 The Contractor shall supervise and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work.

§ 8.3.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner, through the Architect, the names of subcontractors or suppliers for each portion of the Work. The Contractor shall not contract with any subcontractor or supplier to whom the Owner or Architect have made a timely and reasonable objection.

§ 8.4 Labor and Materials

§ 8.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work.

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

§ 8.5 Warranty

The Contractor warrants to the Owner and Architect that: (1) materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform to the requirements of the Contract Documents. Any material or equipment warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 12.5.

§ 8.6 Taxes

The Contractor shall pay sales, consumer, use, and similar taxes that are legally required when the Contract is executed.

§ 8.7 Permits, Fees and Notices

§ 8.7.1 The Contractor shall obtain and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work.

§ 8.7.2 The Contractor shall comply with and give notices required by agencies having jurisdiction over the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs. The Contractor shall promptly notify the Architect in writing of any known inconsistencies in the Contract Documents with such governmental laws, rules, and regulations.

§ 8.8 Submittals

The Contractor shall promptly review, approve in writing, and submit to the Architect shop drawings, product data, samples, and similar submittals required by the Contract Documents. Shop drawings, product data, samples, and similar submittals are not Contract Documents.

§ 8.9 Use of Site

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the Contract Documents, and the Owner.

§ 8.10 Cutting and Patching

The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

§ 8.11 Cleaning Up

The Contractor shall keep the premises and surrounding area free from accumulation of debris and trash related to the Work. At the completion of the Work, the Contractor shall remove its tools, construction equipment, machinery, and surplus material; and shall properly dispose of waste materials.

§ 8.12 Indemnification

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

ARTICLE 9 ARCHITECT

§ 9.1 The Architect will provide administration of the Contract as described in the Contract Documents. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 9.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work.

§ 9.3 The Architect will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor.

§ 9.5 The Architect has authority to reject Work that does not conform to the Contract Documents.

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

§ 9.7 On written request from either the Owner or Contractor, the Architect will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents.

§ 9.8 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from the Contract Documents, and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 9.9 The Architect's duties, responsibilities, and limits of authority as described in the Contract Documents shall not be changed without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

ARTICLE 10 CHANGES IN THE WORK

§ 10.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract, consisting of additions, deletions or other revisions, and the Contract Sum and Contract Time shall be adjusted accordingly, in writing. If the Owner and Contractor cannot agree to a change in the Contract Sum, the Owner shall pay the Contractor its actual cost plus reasonable overhead and profit.

§ 10.2 The Architect may authorize or order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. Such authorization or order shall be in writing and shall be binding on the Owner and Contractor. The Contractor shall proceed with such minor changes promptly.

§ 10.3 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be subject to equitable adjustment.

ARTICLE 11 TIME

§ 11.1 Time limits stated in the Contract Documents are of the essence of the Contract.

§ 11.2 If the Contractor is delayed at any time in progress of the Work by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes beyond the Contractor's control, the Contract Time shall be subject to equitable adjustment.

§ 11.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the responsible party.

ARTICLE 12 PAYMENTS AND COMPLETION

§ 12.1 Contract Sum

The Contract Sum stated in this Agreement, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 12.2 Applications for Payment

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for Work completed in accordance with the values stated in this Agreement. The Application shall be supported by data substantiating the Contractor's right to payment as the Owner or Architect may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

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

§ 12.3 Certificates for Payment

The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in part; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole. If certification or notification is not made within such seven day period, the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time and the Contract Sum shall be equitably adjusted due to the delay.

§ 12.4 Progress Payments

§ 12.4.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents.

§ 12.4.2 The Contractor shall promptly pay each subcontractor and supplier, upon receipt of payment from the Owner, an amount determined in accordance with the terms of the applicable subcontracts and purchase orders.

§ 12.4.3 Neither the Owner nor the Architect shall have responsibility for payments to a subcontractor or supplier.

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

§ 12.5 Substantial Completion

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

§ 12.5.2 When the Contractor believes that the Work or designated portion thereof is substantially complete, it will notify the Architect and the Architect will make an inspection to determine whether the Work is substantially complete. When the Architect determines that the Work is substantially complete, the Architect shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, establish the responsibilities of the Owner and Contractor, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 12.6 Final Completion and Final Payment

§ 12.6.1 Upon receipt of a final Application for Payment, the Architect will inspect the Work. When the Architect finds the Work acceptable and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment.

§ 12.6.2 Final payment shall not become due until the Contractor submits to the Architect releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests, or encumbrances arising out of the Contract.

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

ARTICLE 13 PROTECTION OF PERSONS AND PROPERTY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs, including all those required by law in connection with performance of the Contract. The Contractor shall take reasonable precautions to prevent damage, injury, or loss to employees on the Work and other persons who may be affected thereby, the Work and materials and equipment to be incorporated therein, and other property at the site or adjacent thereto. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, or by anyone for whose acts the Contractor may be liable.

ARTICLE 14 CORRECTION OF WORK

§ 14.1 The Contractor shall promptly correct Work rejected by the Architect as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement, and additional testing.

§ 14.2 In addition to the Contractor's other obligations including warranties under the Contract, the Contractor shall, for a period of one year after Substantial Completion, correct work not conforming to the requirements of the Contract Documents.

§ 14.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 7.3.

ARTICLE 15 MISCELLANEOUS PROVISIONS

§ 15.1 Assignment of Contract

Neither party to the Contract shall assign the Contract as a whole without written consent of the other.

§ 15.2 Tests and Inspections

§ 15.2.1 At the appropriate times, the Contractor shall arrange and bear cost of tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the Architect requires additional testing, the Contractor shall perform those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections, or approvals that do not become requirements until after the Contract is executed. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 15.3 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

ARTICLE 16 TERMINATION OF THE CONTRACT

§ 16.1 Termination by the Contractor

If the Work is stopped under Section 12.3 for a period of 14 days through no fault of the Contractor, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such termination.

§ 16.2 Termination by the Owner for Cause

§ 16.2.1 The Owner may terminate the Contract if the Contractor

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

§ 16.2.2 When any of the above reasons exist, the Owner, after consultation with the Architect, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may

- **.1** take possession of the site and of all materials thereon owned by the Contractor, and
- **.2** finish the Work by whatever reasonable method the Owner may deem expedient.

§ 16.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 16.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 16.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This obligation for payment shall survive termination of the Contract.

§ 16.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 17 OTHER TERMS AND CONDITIONS

(Insert any other terms or conditions below.)

« »

This Agreement entered into as of the day and year first written above.

(If required by law, insert cancellation period, disclosures or other warning statements above the signatures.)

« »

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)* LICENSE NO.: JURISDICTION:

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

«Reedsport Station 7»
«146 N 4th St, Reedsport, OR 97467»

THE OWNER:
(Name, legal status and address)

« City of Reedsport »
« 451 Winchester Ave
Reedsport, OR 97467 »

THE ARCHITECT:
(Name, legal status and address)

Jake Zander
ZCS Engineering & Architecture
524 Main St, Ste 2

TABLE OF ARTICLES

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

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

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

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control

and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be

liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be

taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of

receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

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

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will

promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

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

appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The

Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public

authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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Bid Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

City of Reedsport
451 Winchester Ave
Reedsport, OR 97467

BOND AMOUNT: $ « »

PROJECT:
(Name, location or address, and Project number, if any)

«Reedsport Station 7»
«146 N 4th St, Reedsport, OR 97467»
« »

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

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

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so

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

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

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

furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this « » day of « » , « »

	« »	
	(Contractor as Principal)	*(Seal)*
	« »	
(Witness)	*(Title)*	
	« »	
	(Surety)	*(Seal)*
	« »	
(Witness)	*(Title)*	

DRAFT

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« City of Reedsport »
« 451 Winchester Ave
Reedsport, OR 97467 »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ «0.00»
Description:
(Name and location)

«Reedsport Station 7»
«146 N 4th Ave
Reedsport, OR 97467
»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 16

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
« »
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« »

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

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

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

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

- **.1** the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- **.2** the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- **.3** the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

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Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« City of Reedsport »
« 451 Winchester Ave
Reedsport, OR 97467 »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ «0.00»
Description:
(Name and location)

«Reedsport Station 7»
«146 N 4th St, Reedsport, OR 97467»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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

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

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

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

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

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

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

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

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

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

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

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

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions (ASI) authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests (PR): **Architect** will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by **Architect** are not instructions either to stop work in progress or to execute the proposed change.
2. Within **time specified in Proposal Request or 20 days, when not otherwise specified,** after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to **Architect**.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, **Architect** will issue a Change Order for signatures of Owner and Contractor on .**AIA Document G701.**

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive (CCD): **Architect** may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit two schedules of values for each pay application.
   a. Submit schedule of values for seismic retrofit scope of work.
   b. Submit schedule of values for remodel scope of work.
3. Submit the schedule of values to Architect at earliest possible date, but no later than **seven** days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Arrange schedule of values consistent with format of **AIA Document G703**.
2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of **five** percent of the Contract Sum.
3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site.

4. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
5. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
6. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling **five** percent of the Contract Sum and subcontract amount.

8. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the 14th day of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **Architect** will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. .

E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. Initial progress report.
8. Certificates of insurance and insurance policies.
9. Performance and payment bonds.
10. Data needed to acquire Owner's insurance.

F. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

G. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.
5. AIA Document G706A.
6. AIA Document G707.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 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. 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.
2. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 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. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

8. Startup and adjustment of systems.

1.3 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as 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. Owner name.
2. Owner's Project number.
3. Name of Architect.
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. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. Architect’s Action: Architect will review each RFI, determine action required, and respond. Allow **seven** days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect additional information.
2. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **five** days of receipt of the RFI response.

D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log During regular OAC meeting. [

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect**.**
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

1.4 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's **BIM model** or **CAD drawings** will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in form presented by the Architect. Revise first subparagraph below if Architect's instruments of service are to be used by other entities and are not covered by another data licensing agreement. Coordinate with provisions of Owner/Architect Agreement and Supplementary Conditions.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.5 PROJECT MEETINGS

A. General: **Schedule and conduct** meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: **Architect will schedule and conduct** a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15**days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.

b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Preparation of Record Documents.
m. Use of the premises **and existing building**.
n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: **Conduct** progress Owner/Architect/Contractor (OAC) meetings at **biweekly** intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner**,** and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:
   1) Status of submittals.
   2) Deliveries.
   3) Off-site fabrication.
   4) Site use.
   5) Temporary facilities and controls.
   6) Progress cleaning.
   7) Field observations.
   8) Status of RFIs.
   9) Status of Proposal Requests.
   10) Pending changes.
   11) Status of Change Orders.
   12) Pending claims and disputes.
   13) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 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. 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.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner,[**Commissioning Authority,**] [**Construction Manager,**] or authorities having jurisdiction are not limited by provisions of this Section.

1.2 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified **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 attached to this document as Appendix E**, and as follows:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 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.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, **Owner's construction forces,** Architect, **occupants of Project,** testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use **without metering and without payment of use charges**. Provide connections and extensions of services **and metering** as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use **without metering and without payment of use charges**. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.4 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. Accessible Temporary Egress: Comply with applicable provisions in [**the United States Access Board's ADA-ABA Accessibility Guidelines**.

1.5 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 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Temporary Dispatch Trailer: Of sufficient size (approximately 8ft wide by 20ft long) to accommodate needs of Owner. Furnish and equip offices as follows:
   1. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
   2. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
   3. Provide 2” weatherhead-style pathway and penetration on the exterior of the trailer. Pathway shall serve incoming temporary data infrastructure for the Dispatch operator workstation and equipment. Terminate all incoming temporary data cabling to a surface mount jack. Provide a plywood backboard to mount infrastructure to.
   4. Provide ADA accessible ramp with access to a transaction window for public use.
   5. See other requirements on Technology drawings.

2.2 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities per Site Utilization Plan attached as Appendix F.q

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.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service **overhead** unless otherwise indicated.

D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

E. Electronic Communication Service: Provide infrastructure as outlined in Technology drawings.

3.3 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 according to ASTM E136. Comply with NFPA 241.
2. Utilize designated area within existing building for temporary field offices.
3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Apply for and obtain necessary permits for the closure of N 4th Ave as indicated on Site Utilization Plan attached as Appendix F.
2. Protect existing site improvements to remain including curbs, pavement, and utilities.
3. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: **Use designated areas of Owner's existing** parking areas for construction personnel as indicated on Site Utilization Plan.

D. Storage and Staging: **Use designated areas of Project site** for storage and staging needs as indicated on Site Utilization Plan.

E. 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.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

G. 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.

3.4 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. 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 **authorities having jurisdiction.**

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. 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.

D. operations lawfully, using materials approved by authorities having jurisdiction.

E. 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 indicated on Site Utilization Plan.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. **Furnish one keys to Owner.**

F. 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.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

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.

3.5 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.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 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. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner's portion of the Work.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

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.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 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.

1.3 CLOSEOUT SUBMITTALS

1.4 QUALITY ASSURANCE

A. 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. 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.

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

PART 3 - EXECUTION

3.1 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.

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.

3.2 PREPARATION

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

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before

fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect 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 Architect promptly.

B. Engage a **land surveyor experienced** in laying out the Work, using the following accepted surveying practices:
   1. Establish limits on use of Project site.
   2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   3. Inform installers of lines and levels to which they must comply.
   4. Check the location, level and plumb, of every major element as the Work progresses.
   5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
   6. 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.

   1. a site corner to a legal point.

3.4 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

   1. Make vertical work plumb, and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

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 Architect.
2. 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.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

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

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to **prevent**] interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. **Concrete and Masonry**: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. 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. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
1.

3.6 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. 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.

3. 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. 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.

H. 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.

I. 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.

3.7 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.

3.8 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. 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.

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

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list").

B. Submittals Prior to Remodel Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner**.** Label with manufacturer's name and model number.
5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Remodel Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architectwill either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
d. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
e. Vacuum and mop concrete.
f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
h. Remove labels that are not permanent.
i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
l. Clean ducts, blowers, and coils **if units were operated without filters during construction or that display contamination with particulate matter on inspection**.

m. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
n. Clean strainers.
o. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, [binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

C. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

D. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
1. .
2. Special operating instructions and procedures.

1.5 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

B. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

C. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

D. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

1.7 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Final Submittal:

1) Submit one paper-copy set of marked-up record prints.
2) Submit PDF electronic files of scanned Record Prints.
3) Print each drawing, whether or not changes and additional information were recorded.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.

e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Locations and depths of underground utilities.
d. Revisions to routing of piping and conduits.
e. Revisions to electrical circuitry.
f. Revisions to actual equipment locations.
g. Revisions to duct size and routing.
h. Changes made by Change Order or Construction Change Directive.
i. Changes made following Architect's written orders.
j. Details not on the original Contract Drawings.
k. Field records for variable and concealed conditions.

3. Mark the Contract Drawings and Shop Drawings completely and accurately.

1.4 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.2 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training.

1.3 INSTRUCTION PROGRAM

A. Training Modules: Include instruction for the following as applicable to the system, equipment, or component:

1. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

2. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.

c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

3. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

4. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

5. Repairs: Include the following:

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

1.4 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed-on times.

1. Schedule training with Owner.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 22 0518
ESCUTCHEONS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Escutcheons.

PART 2 PRODUCTS

2.01 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Insulated Piping: One-piece, stamped-steel type.
      c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type
      d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
      e. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
      f. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

3.02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons using new material

END OF SECTION 22 05 18 22 0518

SECTION 22 0519
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Liquid-in-glass thermometers.
   2. Thermowells.
   3. Test plugs.
   4. Test-plug kits.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Flo Fab Inc.
      b. Miljoco Corporation.
      c. Palmer Wahl Instrumentation Group.
      d. Tel-Tru Manufacturing Company.
      e. Trerice, H. O. Co.
      f. Weiss Instruments, In
      g. Winters Instruments - U.S.
   2. Standard: ASME B40.200.
   3. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
   4. Case Form: Adjustable angle unless otherwise indicated.
   5. Tube: Glass with magnifying lens and blue or red organic liquid.
   6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
   7. Window: Glass or plastic.
   8. Stem: Aluminum and of length to suit installation.
      a. Design for Thermowell Installation: Bare stem.
   9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
   10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Ernst Flow Industries.
      b. Marsh Bellofram.
      c. Miljoco Corporation.
      d. Palmer Wahl Instrumentation Group.
      e. REOTEMP Instrument Corporation.
      f. Watts Regulator Co.; a div. of Watts Water Technologies. Inc.
      g. Weiss Instruments, Inc.
      h. WIKA Instrument Corporation - USA.
   2. Standard: ASME B40.200.

3. Case: Plastic; 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Window: Glass or plastic.
7. Stem: Aluminum, brass, or stainless steel and of length to suit installation.
   a. Design for Thermowell Installation: Bare stem.
8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.02 THERMOWELLS

A. Thermowells:
   1. Standard: ASME B40.200.
   2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
   3. Material for Use with Copper Tubing: CNR or CUNI.
   4. Material for Use with Steel Piping: CRES.
   5. Type: Stepped shank unless straight or tapered shank is indicated.
   6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
   7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
   8. Bore: Diameter required to match thermometer bulb or stem.
   9. Insertion Length: Length required to match thermometer bulb or stem.
   10. Lagging Extension: Include on thermowells for insulated piping and tubing.
   11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.03 TEST PLUGS

A. 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. Flow Design, Inc.
   2. Miljoco Corporation.
   3. National Meter, Inc.
   4. Peterson Equipment Co., Inc.
   5. Sisco Manufacturing Company, Inc.
   6. Trerice, H. O. Co.
   7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   8. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.04 TEST-PLUG KITS

A. 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. Flow Design, Inc.
   2. Miljoco Corporation.
   3. National Meter, Inc.
   4. Peterson Equipment Co., Inc.
   5. Sisco Manufacturing Company, Inc.
   6. Trerice, H. O. Co.

7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing one thermometer(s) and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install thermometers in the following locations:
1. Inlet and outlet of each water heater.

3.02 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.03 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.04 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be the following:
1. Industrial-style, liquid-in-glass type.
2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.05 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

END OF SECTION 22 0519

SECTION 22 0523
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.
   3. Iron, grooved-end butterfly valves.
   4. Bronze lift check valves.
   5. Bronze swing check valves.
   6. Iron swing check valves.
   7. Iron, grooved-end swing check valves.

B. Related Sections:
   1. Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
   2. Section 22 11 13 "Facility Water Distribution Piping" for valves applicable only to this piping.
   3. Section 22 11 16 "Domestic Water Piping" for valves applicable only to this piping.

1.03 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.04 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   2. ASME B31.1 for power piping valves.
   3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Set butterfly valves closed or slightly open.
   6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.02 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:
1. 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:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
   d. Hammond Valve.
   e. Jamesbury; a subsidiary of Metso Automation.
   f. Kitz Corporation.
   g. Marwin Valve; a division of Richards Industries.
   h. Milwaukee Valve Company.
   i. RuB Inc.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Stainless steel.
   i. Ball: Stainless steel, vented.
   j. Port: Full.

B. Three-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. 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:
    a. Jomar International, LTD.
    b. Kitz Corporation.
    c. Marwin Valve; a division of Richards Industries.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.
    d. Body Design: Three piece.
    e. Body Material: Forged brass.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Stainless steel.
    i. Ball: Stainless steel, vented.
    j. Port: Full.

2.03 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
1. 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:
    a. Conbraco Industries, Inc.; Apollo Valves.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Hammond Valve.
    d. Lance Valves; a division of Advanced Thermal Systems, Inc.
    e. Milwaukee Valve Company.
    f. NIBCO INC.
    g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.
    d. Body Design: Two piece.
    e. Body Material: Bronze.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Stainless steel.
    i. Ball: Stainless steel, vented.
    j. Port: Full.

B. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
1. 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:
    a. Conbraco Industries, Inc.; Apollo Valves.
    b. Hammond Valve.
    c. Milwaukee Valve Company.
    d. NIBCO INC.
2. Description:
    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.

d. Body Design: Three piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.04 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. 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:
a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.
2. Description:
a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.05 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:
1. 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:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Sure Flow Equipment Inc.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.
2. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.06 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:
1. 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:
a. Anvil International, Inc.
b. Shurjoint Piping Products.
c. Tyco Fire Products LP; Grinnell Mechanical Products.
d. Victaulic Company.
2. Description:
a. CWP Rating: 300 psig.
b. Body Material: ASTM A 536, ductile iron.
c. Seal: EPDM.
d. Disc: Spring-operated, ductile iron or stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
1. Swing Check Valves: In horizontal position with hinge pin level.

3.03 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
1. Shutoff Service: Ball.
2. Throttling Service: Ball.
a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal or resilient-seat check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
   4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
   5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   6. For Steel Piping, NPS 5 and Larger: Flanged ends.
   7. For Grooved-End Steel Piping: Valve ends may be grooved.

3.05 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Ball Valves: Two or Three piece, full port, brass or bronze with stainless-steel trim.
   3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:
   1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
   2. Iron, Grooved-End Butterfly Valves: 175 CWP.
   3. Iron Swing Check Valves: Class 125, metal seats.
   4. Iron, Grooved-End Swing Check Valves: 300 CWP.

END OF SECTION 22 22 0523

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Thermal-hanger shield inserts.
   5. Fastener systems.

B. Related Sections:
   1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPE□E PIPE HANGERS

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

2.03 METAL FRAMING SYSTEMS

A. 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. Allied Tube & Conduit.
   2. Cooper B-Line, Inc.
   3. Flex-Strut Inc.
   4. GS Metals Corp.
   5. Thomas & Betts Corporation.
   6. Unistrut Corporation; Tyco International, Ltd.
   7. Wesanco, Inc.
   8. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
   9. Standard: MFMA-4.
   10. Channels: Continuous slotted steel channel with inturned lips.
   11. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
   12. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
   13. Metallic Coating: Electroplated zinc.
   14. Paint Coating: Vinyl.

B. Non-MFMA Manufacturer Metal Framing Systems:
   1. 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:
      a. Anvil International; a subsidiary of Mueller Water Products Inc.
      b. Empire Industries, Inc.
      c. ERICO International Corporation.
      d. Haydon Corporation; H-Strut Division.
      e. NIBCO INC.
      f. PHD Manufacturing, Inc.
      g. PHS Industries, Inc.
   2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
   3. Standard: Comply with MFMA-4.
   4. Channels: Continuous slotted steel channel with inturned lips.
   5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
   6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
   7. Coating: Zinc.

2.04 THERMAL-HANGER SHIELD INSERTS

A. 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. Carpenter & Paterson, Inc.
   2. Clement Support Services.
   3. ERICO International Corporation.
   4. National Pipe Hanger Corporation.
   5. PHS Industries, Inc.
   6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
   7. Piping Technology & Products, Inc.
   8. Rilco Manufacturing Co., Inc.
   9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.05 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, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.06 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal 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 the building structure.

B. Metal 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 for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. 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.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. 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.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. 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.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
      c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
      d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
   6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.03 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 91 23 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.05 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are 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 carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. 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 up to 1050 deg F, pipes NPS 4 to NPS 24, 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 36, 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 8.

10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-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 or carbon-steel plate.
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 or carbon-steel plate, 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 two 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 24, 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.

K. 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 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. 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.

M. 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.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 22 05 29 22 0529

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Piping: Pipe markers.

2.02 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradycorp.com/#sle.
   2. Brimar Industries, Inc: www.pipemarker.com/#sle.
   3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
   4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
   5. Seton Identification Products: www.seton.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

F. Color code as follows:
   1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION 22 0553

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Domestic recirculating hot-water piping.
   4. Supplies and drains for handicap-accessible lavatories and sinks.

1.03 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.05 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.06 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corp.; SoftTouch Duct Wrap.
      b. Johns Manville; Microlite.
      c. Knauf Insulation; Friendly Feel Duct Wrap.
      d. Manson Insulation Inc.; Alley Wrap.
      e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Fibrex Insulations Inc.; Coreplus 1200.
      b. Johns Manville; Micro-Lok.
      c. Knauf Insulation; 1000-Degree Pipe Insulation.
      d. Manson Insulation Inc.; Alley-K.
      e. Owens Corning; Fiberglas Pipe Insulation.
   2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Super-Stik.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.03 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
      d. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
      b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
d. Mon-Eco Industries, Inc.; 22-25.

D. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2.04 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
b. Eagle Bridges - Marathon Industries; 501.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
d. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.05 SEALANTS

A. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F.
   5. Color: White.

2.06 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.07 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.

2.08 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.09 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville; Zeston.
      b. P.I.C. Plastics, Inc.; FG Series.
      c. Proto Corporation; LoSmoke.
      d. Speedline Corporation; SmokeSafe.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: Color-code jackets based on system. Color as selected by Architect.
   4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.10 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. ABI, Ideal Tape Division; 370 White PVC tape.
    b. Compac Corporation; 130.
    c. Venture Tape; 1506 CW NS.
2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:
1. 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:
    a. Engineered Brass Company.
    b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
    c. McGuire Manufacturing.
    d. Plumberex.
    e. Truebro; a brand of IPS Corporation.
    f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures,:
1. 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:
    a. Truebro; a brand of IPS Corporation.
    b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Cleanouts.

3.04 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.05 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.06 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.07 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

C. Install PVC jackets in:
1. Any Exposed piping in areas where piping insulation is likely to be damaged shall have PVC jacketing.
2. All exposed piping in mechanical rooms or storage closets below 9’ shall be covered with PVC jacketing.
3. All exposed piping below 9’ in occupied spaces. (not covered above).

3.08 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.09 REFER TO DRAWINGS FOR DUCT INSULATION SCHEDULE

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
2. NPS 1-1/4 and Larger: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:
1. NPS 1-1/4 and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/2 and Larger: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

D. Wall box traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:
1. PVC, Color- white: 20 mils thick.

END OF SECTION 22 07 19 22 0719

SECTION 22 1116
DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.03 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.04 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

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

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

D. Copper Unions:
   1. MSS SP-123.
   2. Cast-copper-alloy, hexagonal-stock body.
   3. Ball-and-socket, metal-to-metal seating surfaces.
   4. Solder-joint or threaded ends.

2.03 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys.

B. Flux: ASTM B 813, water flushable.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.04 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cascade Waterworks Manufacturing.

b. Dresser, Inc.; Piping Specialties Products.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc.; a Sensus company.
g. Viking Johnson.

2.05 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. 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:
a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International.
e. Matco-Norca.
f. McDonald, A. Y. Mfg. Co.
g. Watts; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.
2. Standard: ASSE 1079.
3. Pressure Rating: 150 PSIG.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. 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:
a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Matco-Norca.
d. Watts; a division of Watts Water Technologies, Inc.
e. Wilkins; a Zurn company.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 150 PSIG.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. 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:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. 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:
   a. Elster Perfection Corporation.
   b. Grinnell Mechanical Products; Tyco Fire Products LP.
   c. Matco-Norca.
   d. Precision Plumbing Products, Inc.
   e. Victaulic Company.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install domestic water piping level and plumb.

F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping to permit valve servicing.

K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

O. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for

Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.02 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.03 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.04 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.05 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

C. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
   3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
   4. NPS 2-1/2: 108 inches with 1/2-inch rod.
   5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

D. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   2. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.07 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
      b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
         1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
         2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
      c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
      d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
   2. Piping Tests:
      a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
      b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
      c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
      d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
      e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
      f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.09 ADJUSTING

A. Perform the following adjustments before operation:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to fully open position.
   3. Open throttling valves to proper setting.
   4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:
1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

D. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be the following:
1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 22 11 16 22 1116

SECTION 22 1316
SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.

1.03 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.04 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.05 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste 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 Construction Manager Owner no fewer than two days in advance of proposed interruption of sanitary waste service.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

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

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

A. Pipe and Fittings: ASTM A 74, Service class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. CISPI, Hubless-Piping Couplings:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ANACO-Husky.
      b. Dallas Specialty & Mfg. Co.
      c. Fernco Inc.
      d. Matco-Norca, Inc.
      e. MIFAB, Inc.
      f. Mission Rubber Company; a division of MCP Industries, Inc.
      g. Stant.

h. Tyler Pipe.
2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. MG Piping Products Company.
2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.04 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.

D. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.

E. Copper Pressure Fittings:
1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.05 ABS PIPE AND FITTINGS

A. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.

B. Cellular-Core ABS Pipe: ASTM F 628, Schedule 40.

C. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

D. Solvent Cement: ASTM D 2235.
1. ABS solvent cement shall have a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.06 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.
1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer 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. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.07 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Dallas Specialty & Mfg. Co.
      2) Fernco Inc.
      3) Mission Rubber Company; a division of MCP Industries, Inc.
      4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
   b. Standard: ASTM C 1173.
   c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   d. Sleeve Materials:
      1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
   e. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cascade Waterworks Mfg. Co.
      2) Mission Rubber Company; a division of MCP Industries, Inc.
   f. Standard: ASTM C 1460.
   g. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Dielectric Fittings:
1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Capitol Manufacturing Company.
      2) Central Plastics Company.
      3) Hart Industries International, Inc.
      4) Jomar International Ltd.
      5) Matco-Norca, Inc.
      6) McDonald, A. Y. Mfg. Co.
      7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      8) Wilkins; a Zurn company.
   b. Description:
      1) Standard: ASSE 1079.
      2) Pressure Rating: 125 psig minimum at 180 deg F.

3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Capitol Manufacturing Company.
      2) Central Plastics Company.
      3) Matco-Norca, Inc.
      4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      5) Wilkins; a Zurn company.
   b. Description:
      1) Standard: ASSE 1079.
      2) Factory-fabricated, bolted, companion-flange assembly.
      3) Pressure Rating: 125 psig minimum at 180 deg F.
      4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Advance Products & Systems, Inc.
      2) Calpico, Inc.
      3) Central Plastics Company.
      4) Pipeline Seal and Insulator, Inc.
   b. Description:
      1) Nonconducting materials for field assembly of companion flanges.
      2) Pressure Rating: 150 psig .
      3) Gasket: Neoprene or phenolic.
      4) Bolt Sleeves: Phenolic or polyethylene.
      5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Elster Perfection.
      2) Grinnell Mechanical Products.
      3) Matco-Norca, Inc.
      4) Precision Plumbing Products, Inc.
      5) Victaulic Company.
   b. Description:
      1) Standard: IAPMO PS 66
      2) Electroplated steel nipple.
      3) Pressure Rating: 300 psig at 225 deg F.
      4) End Connections: Male threaded or grooved.
      5) Lining: Inert and noncorrosive, propylene.

PART 3 EXECUTION

3.01 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

N. Install steel piping according to applicable plumbing code.

O. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

Q. Install underground PVC piping according to ASTM D 2321.

R. Install engineered soil and waste drainage and vent piping systems as follows:
   1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
   2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
   3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

S. Plumbing Specialties:
   1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
   2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.03 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

E. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

F. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
   3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.04 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in OD's.
   2. In Drainage Piping: Unshielded, nonpressure transition couplings.
   3. In Aboveground Force Main Piping: Fitting-type transition couplings.
   4. In Underground Force Main Piping:
      a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
      b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:
   1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
   2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples unions.
   3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges flange kits nipples.
   4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.05 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
   2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
   3. Vertical Piping: MSS Type 8 or Type 42, clamps.
   4. Install individual, straight, horizontal piping runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
   4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/4: 84 inches with 3/8-inch rod.
   2. NPS 1-1/2: 108 inches with 3/8-inch rod.
   3. NPS 2: 10 feet with 3/8-inch rod.
   4. NPS 2-1/2: 11 feet with 1/2-inch rod.
   5. NPS 3: 12 feet with 1/2-inch rod.
   6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

I. Install supports for vertical steel piping every 15 feet.

J. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 2: 84 inches with 3/8-inch rod.
   2. NPS 3: 96 inches with 1/2-inch rod.
   3. NPS 4: 108 inches with 1/2-inch rod.

K. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/4: 72 inches with 3/8-inch rod.
   2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
   3. NPS 2-1/2: 108 inches with 1/2-inch rod.
   4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.

L. Install supports for vertical copper tubing every 10 feet.

M. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:
   1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
   3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
   4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.07 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.08 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.09 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
   3. Copper DWV tube, copper drainage fittings, and soldered joints.
   4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

C. Aboveground, vent piping NPS 4 and smaller shall be the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
   3. Copper DWV tube, copper drainage fittings, and soldered joints.
      a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
   4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
   1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
   3. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
   4. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   5. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 22 13 16 22 1316

SECTION 22 1319
SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

B. Section Includes:
   1. Cleanouts.
   2. Floor drains.

C. Related Requirements:
   1. Section 22 14 23 "Storm Drainage Piping Specialties" for storm drainage piping inside the building, drainage piping specialties, and drains.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
   1. Floor drains
   2. Clean outs

1.05 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.

1.06 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 PRODUCTS

2.01 CLEANOUTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Josam Company.
   2. MIFAB, Inc.
   3. Smith, Jay R. Mfg. Co.
   4. Tyler Pipe, Wade division.
   5. Watts Drainage Products.

6. Zurn Plumbing Products Group.

2.02 FLOOR DRAINS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Commercial Enameling Co.
   2. Josam Company; Josam Div.
   3. MIFAB, Inc.
   4. Prier Products, Inc.
   5. Smith, Jay R. Mfg. Co.
   6. Tyler Pipe; Wade Div.
   7. Watts Drainage Products.
   8. Zurn Plumbing Products Group;.

2.03 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
   3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

2.04 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

2.05 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

2.06 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 22 13 19 22 1319

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Lavatories.

C. Sinks.

D. Service sinks.

E. Under-lavatory pipe supply covers.

F. Showers.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between fixtures and walls and floors.

B. Section 22 1005 - Plumbing Piping.

C. Section 22 1006 - Plumbing Piping Specialties.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.

C. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2022).

D. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.

E. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018, with Errata.

F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2022.

G. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2021.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

I. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

J. NSF 372 - Drinking Water System Components - Lead Content 2022.

K. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

2.03 TANK TYPE WATER CLOSETS

A. Tank Type Water Closet Manufacturers:
   1. American Standard, Inc: www.americanstandard-us.com/#sle.
   2. DXV by American Standard, Inc: www.dxv.com/#sle.
   3. Gerber Plumbing Fixtures LLC: www.gerberonline.com/#sle.
   4. Kohler Company: www.kohler.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 16.5 inches (420 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
   1. Water Consumption: Maximum 1.6 gallons (6 liters) per flush.

C. Seat Manufacturers:
   1. American Standard, Inc: www.americanstandard-us.com/#sle.
   2. Bemis Manufacturing Company: www.bemismfg.com/#sle.
   3. Church Seat Company: www.churchseats.com/#sle.
   4. DXV by American Standard, Inc: www.dxv.com/#sle.
   5. Zurn Industries, Inc.
   6. Substitutions: See Section 01 6000 - Product Requirements.

D. Seat: Solid white plastic, open front, extended back, less cover, complete with self-sustaining hinge.

2.04 LAVATORIES

A. Manufacturers:
   1. American Standard, Inc: www.americanstandard-us.com/#sle.
   2. DXV by American Standard, Inc; [_____]: www.dxv.com/#sle.
   3. Crane Plumbing
   4. Gerber Plumbing Fixtures LLC: www.gerberonline.com/#sle.
   5. Kohler Company: www.kohler.com/#sle.
   6. Zurn Industries, Inc: www.zurn.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, 21"x18" minimum, with 4 inch (100 mm) high back, rectangular basin with splash lip, front overflow, and soap depression.
   1. Drilling Centers: 4 inch (100 mm).

C. Supply Faucet Manufacturers:
   1. Advanced Modern Technologies Corporation; AEF-300 Series, Wall Mounted: www.amtcorporation.com/#sle.
   2. American Standard, Inc: www.americanstandard-us.com/#sle.
   3. DXV by American Standard, Inc: www.dxv.com/#sle.
   4. Bradley Corporation
   5. Chicago Faucets

6. Gerber Plumbing Fixtures
7. Kohler Company: www.kohler.com/#sle.
8. Moen Incorporated
9. Sloan Valve Company
10. Speakman Company
11. Zurn Industries, Inc: www.zurn.com/#sle.
12. Substitutions: See Section 01 6000 - Product Requirements.

D. Sensor Operated Faucet: Cast brass, chrome plated, wall mounted with sensor located on neck of spout.
1. Spout Style: Standard.
2. Mixing Valve: Internal, automatic.
3. Water Supply: 3/8 inch (9 mm) compression connections.
4. Aerator: Vandal resistant, 0.5 gpm (1.89 Lpm), laminar flow device.
5. Finish: Polished chrome.

2.05 SINKS

A. Manufacturers:
1. American Standard, Inc; [_____]: www.americanstandard-us.com/#sle.
2. Elkay.
3. Kohler Company; [_____]: www.kohler.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Single Compartment Bowl: ASME A112.19.1; 31 by 22 by [7-5/8] inch ([_____] by [_____] by [_____] mm) outside dimensions 20 gauge, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
1. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

C. Double Compartment Bowl: ASME A112.19.1; 29 by 22 by [7-5/8] inch ([_____] by [_____] by [_____] mm) outside dimensions 20 gauge, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
1. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:
1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
2. [_____].
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
1. Fusion Molded Under-Lavatory Insulators (Non-Sewn): Plumberex Handy-Shield Maxx.

C. General:
1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
   a. Comply with ASTM C1822 Type I for covers on accessible lavatory piping.
   b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
   c. Comply with ICC A117.1.
3. Color: High gloss white.

2.07 SHOWERS

A. Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
2. Aqua Glass Corporation: www.aquaglass.com/#sle.
3. Best Bath Systems: www.bestbath.com/#sle.
4. Grohe America, Inc: www.grohe.com/us/#sle.
5. Jacuzzi: www.jacuzzi.com/#sle.

6. Kohler Company: www.kohler.com/#sle.
7. Aquarius
8. Substitutions: See Section 01 6000 - Product Requirements.

2.08 SERVICE SINKS

A. Manufacturers:
1. Fiat Products.
2. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 22 4000

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Thermal-hanger shield inserts.
   4. Fastener systems.
   5. Equipment supports.

B. Related Sections:
   1. Section 23 05 16 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
   2. Section 23 31 13 "Metal Ducts" for duct hangers and supports.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPE□E PIPE HANGERS

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

2.03 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Carpenter & Paterson, Inc.
   2. Clement Support Services.
   3. ERICO International Corporation.
   4. National Pipe Hanger Corporation.

5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.04 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, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.05 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.06 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal 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 the building structure.

B. Metal 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 for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. 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.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. 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.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. 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.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:
1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.04 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are 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 carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. 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 up to 1050 deg F, pipes NPS 4 to NPS 24, 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 36, 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 8.
   10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
   11. Extension Hinged or Two-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 or carbon-steel plate.
   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 or carbon-steel plate, 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 two 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 24, 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.

K. 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 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. 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.

M. 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.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
    2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
    3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
    2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
    3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
    4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
    5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
    6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
    7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
    8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
        a. Horizontal (MSS Type 54): Mounted horizontally.
        b. Vertical (MSS Type 55): Mounted vertically.
        c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29 23 0529

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes insulating the following duct services:
   1. Indoor, round concealed supply.
   2. Indoor, round concealed return.
   3. Indoor, concealed exhaust to a point 10’ from and penetration of building exterior.
   4. Indoor, exposed exhaust to a point 10’ from penetration of building exterior.
   5. Indoor, fresh air intake ducts from the air handling unit to and including the back of the intake louver.

B. Related Sections:
   1. Section 230716 "HVAC Equipment Insulation."
   2. Section 233113 "Metal Ducts" for duct liners.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.Eagle Bridges - Marathon Industries; 225.
      b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.

2.03 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
   1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
      b. Vimasco Corporation; 749.
   2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg F.
   4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
      b. Eagle Bridges - Marathon Industries; 550.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
      d. Mon-Eco Industries, Inc.; 55-50.
      e. Vimasco Corporation; WC-1/WC-5.

2.04 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.Eagle Bridges - Marathon Industries; 405.
      b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
      c. Mon-Eco Industries, Inc.; 44-05.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F.
   5. Color: Aluminum.

2.05 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.06 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas No. 5.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
      b. Vimasco Corporation; Elastafab 894.

2.07 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.08 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ABI, Ideal Tape Division; 491 AWF FSK.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
      c. Compac Corporation; 110 and 111.

d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.09 SECUREMENTS

A. Bands:
1. Products: Subject to compliance with requirements, provide one of the following:
a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal.

B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
a. Products: Subject to compliance with requirements, provide one of the following:
1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
a. Products: Subject to compliance with requirements, provide one of the following:
1) AGM Industries, Inc.; CHP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
a. Products: Subject to compliance with requirements, provide one of the following:
1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.
b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
a. Products: Subject to compliance with requirements, provide one of the following:
1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

2.10 CORNER ANGLES

A. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.04 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
   1. Comply with requirements in Section 078413 "Penetration fire-stopping” and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:
   1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Fire-stopping."

3.05 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
      b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
      c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
      d. Do not over-compress insulation during installation.
      e. Impale insulation over pins and attach speed washers.
      f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
   4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c.

Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over-compress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

7. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
8. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
9. Completely encapsulate insulation with coating, leaving no exposed insulation.
10. Draw jacket material smooth and tight.
11. Install lap or joint strips with same material as jacket.
12. Secure jacket to insulation with manufacturer's recommended adhesive.
13. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
14. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.06 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
1. Indoor, round concealed supply (ducts other than double wall)
2. Indoor, round concealed return air. (ducts other than double wall)
3. Indoor, concealed exhaust to a point 10' from the penetration of building exterior.
4. Indoor, exposed exhaust to a point 10' from penetration of building exterior.
5. Flexible connections at the supply discharge of the air handling units.
6. All Fresh air ducts from the exterior louver to the air handling unit shall be insulated.
7. All exhaust ducts directly connected to the air handling unit to the point of penetration to the building exterior.

B. Items Not Insulated:
1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

3.07 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

E. Concealed or exposed, exhaust-air plenums or ducts insulation shall be the following:
1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

F. Concealed or exposed fresh air intake ducts from air handling unit to and including the exterior of the louver penetration at the building exterior.

G. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

3.08 REFER TO DRAWINGS FOR DUCT INSULATION AND LINER SCHEDULE.

END OF SECTION 230713 23 0713

SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Refrigerant pipes and fittings.
   2. Refrigerant piping valves and specialties.
   3. Refrigerants.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig.
   2. Suction Lines for Heat-Pump Applications: 535 psig.
   3. Hot-Gas and Liquid Lines: 535 psig.

2.02 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type L or ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8/A5.8M.

E. Flexible Connectors:
   1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
   2. End Connections: Socket ends.
   3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
   4. Working Pressure Rating: Factory test at minimum 500 psig.
   5. Maximum Operating Temperature: 250 deg F.

2.03 VALVES AND SPECIALTIES

A. Service Valves:
   1. Body: Forged brass with brass cap including key end to remove core.
   2. Core: Removable ball-type check valve with stainless-steel spring.
   3. Seat: Polytetrafluoroethylene.

4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

B. Thermostatic Expansion Valves: Comply with AHRI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F or as required by manufacturer.
6. Superheat: Adjustable or non-adjustable as recommended by equipment manufacturer.
7. End Connections: Socket, flare, or threaded union.
8. Working Pressure Rating: 450 psig.

C. Receivers: Comply with AHRI 495.
1. Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

D. Liquid Accumulators: Comply with AHRI 495.
1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.04 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 EXECUTION

3.01 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type ACR or Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR or Type L, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR or Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.02 VALVE AND SPECIALTY APPLICATIONS

A. Install thermostatic expansion valves as close as possible to distributors on evaporators.
1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

B. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

C. Provide traps at each vertical gas riser as recommended by manufacturer.

D. Where evaporator coils are located at a higher elevation than associated condensing units, additional considerations are necessary. Coordinate sizing, trap, and equipment requirements with cooling equipment manufacturer.

E. Where required by manufacturer, install receivers and/or accumulators.

F. Install flexible connectors at condensing units larger than 5 tons.

3.03 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 0 if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

M. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.
   3. Install traps and double risers to entrain oil in vertical runs.
   4. Liquid lines may be installed level.

N. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

O. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

P. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.04 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
   1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
   2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.05 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
   2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
   1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
   2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
   3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
   4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
   5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
   6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.

D. Support multifloor vertical runs at least at each floor.

3.06 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Comply with ASME B31.5, Chapter VI.
   2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
   3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
      a. Fill system with nitrogen to the required test pressure.
      b. System shall maintain test pressure at the manifold gage throughout duration of test.
      c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
      d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.07 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Install core in filter dryers after leak test but before evacuation.
   2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
   3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
   4. Charge system with a new filter-dryer core in charging line.

3.08 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
   1. Open shutoff valves in condenser water circuit.
   2. Verify that compressor oil level is correct.
   3. Open compressor suction and discharge valves.
   4. Open refrigerant valves except bypass valves that are used for other purposes.
   5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

END OF SECTION 232300 23 2300

SECTION 23 3113
METAL DUCTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Single-wall rectangular ducts and fittings.
   2. Single-wall round and flat-oval ducts and fittings.
   3. Sheet metal materials.
   4. Duct liner.
   5. Sealants and gaskets.
   6. Hangers and supports.

B. Related Sections:
   1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
   2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.

B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory- and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

PART 2 PRODUCTS

2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.02 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. LaPine Metal
      b. Lindab Inc.
      c. McGill AirFlow LLC.
      d. SEMCO Incorporated.
      e. Sheet Metal Connectors, Inc.
      f. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
   2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.03 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G60.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.04 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation; Insulation Group.
      b. Johns Manville.
      c. Knauf Insulation.
      d. Owens Corning.
      e. Maximum Thermal Conductivity:
         1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
   2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
   3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Insulation Pins and Washers:
   1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
   2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
   1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
   2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
   3. Butt transverse joints without gaps, and coat joint with adhesive.
   4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
   5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
   6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
   7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

a. Fan discharges.
b. Intervals of lined duct preceding unlined duct.
c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

8. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.05 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.06 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
   1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
   2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
   3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

M. Duct sizes on the plans are the interior free area dimension. The contractor is responsible to oversize duct accordingly to account for duct liner thickness to maintain free area dimensions as listed on the drawings.

3.02 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.03 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, 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.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. 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.

3.05 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct system will be considered defective if it does not pass tests and inspections.

3.08 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.09 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as indicated on the drawings:

B. Supply Ducts:
   1. Ducts Connected to Roof top units, and indoor air handling units, and terminal units:
      a. Pressure Class: Positive 2-inch wg.
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Return Ducts:
   1. Ducts Connected to Terminal Units:
      a. Pressure Class: Positive or negative 1-inch wg.
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.
   2. Ducts Connected to Roof top units and indoor air-Handling Units:
      a. Pressure Class: Positive or negative 2-inch wg.
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.

D. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 2-inch wg.
      b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.
   2. Ducts Connected to Air-Handling Units:
      a. Pressure Class: Positive or negative 2-inch wg.
      b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.
      e. SMACNA Leakage Class: 3.

E. Liner:
   1. Metal ducts with duct liner are to be of sufficient thickness and density to comply with energy code and ASHRAE/IESNA 90.1.
   2. All exposed and concealed Supply and Return ducts and plenums are to be lined, except where indicated other on the drawings. Exhaust ducts connected to roof mounted Exhaust Fans (EF) are not lined. Exhaust ducts within 10’ of the penetration to the point where the duct penetrates the exterior of the building shall be externally wrapped.
   3. Supply Air Ducts: Fibrous glass, Type I, 1 inch thick.
   4. Return Air Ducts: Fibrous glass, Type I, 1 inch thick.
   5. Transfer Air Ducts: Fibrous glass, Type I, 1 inch thick.

F. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
        1) Radius-to Diameter Ratio: 1.5.
    b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
    c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113 23 3113

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Manual volume dampers.
   2. Flange connectors.
   3. Turning vanes.
   4. Flexible connectors.
   5. Flexible ducts.
   6. Duct accessory hardware.

B. Related Requirements:
   1. Section 23 37 23 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
   2. Section 28 31 11 "Digital, Addressable Fire-Alarm System" for duct-mounted fire and smoke detectors.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.02 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G60.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Air Balance Inc.; a division of Mestek, Inc.
      b. American Warming and Ventilating; a division of Mestek, Inc.

c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Pottorff.
g. Ruskin Company.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Damper Hardware:
   1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
   2. Include center hole to suit damper operating-rod size.
   3. Include elevated platform for insulated duct mounting.

2.04 FLANGE CONNECTORS

A. 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. Ductmate Industries, Inc.
   2. Nexus PDQ; Division of Shilco Holdings Inc.
   3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.05 TURNING VANES

A. 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. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Elgen Manufacturing.
   4. METALAIRE, Inc.
   5. SEMCO Incorporated.
   6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
   1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.06 FLEXIBLE CONNECTORS

A. 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. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Elgen Manufacturing.
   4. Ventfabrics, Inc.
   5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd..
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

F. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
   1. Minimum Weight: 16 oz./sq. yd..
   2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
   3. Service Temperature: Minus 67 to plus 500 deg F.

2.07 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Flexmaster U.S.A., Inc.
   2. McGill AirFlow LLC.
   3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Noninsulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire.
   1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 10 to plus 160 deg F.

C. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
   1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 10 to plus 160 deg F.
   4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

D. Flexible Duct Connectors:
   1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
   2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.08 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install flexible connectors to connect ducts to equipment.

G. Connect diffusers or light troffer boots to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

H. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

I. Install duct test holes where required for testing and balancing purposes.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.

END OF SECTION 23 3300

SECTION 23 3346
FLEXIBLE DUCTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Insulated flexible ducts.

PART 2 PRODUCTS

2.01 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

2.02 INSULATED FLEXIBLE DUCTS

A. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
   1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 10 to plus 160 deg F.
   4. Insulation R-Value: Comply with ASHRAE/IES 90.1 R4.2.

2.03 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

D. Connect flexible ducts to metal ducts with draw bands.

E. Install duct test holes where required for testing and balancing purposes.

F. Installation:
   1. Install ducts fully extended.
   2. Do not bend ducts across sharp corners.
   3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
   4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
   5. Install flexible ducts in a direct line, without sags, twists, or turns.

G. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346 23 3346

SECTION 23 3416
CENTRIFUGAL HVAC FANS

PART 2 PRODUCTS

1.01 PERFORMANCE REQUIREMENTS

1.02 WHEEL AND INLET

1.03 BEARINGS AND DRIVES

END OF SECTION 23 3416

SECTION 23 3713
REGISTERS AND GRILLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Grilles, Registers, Diffusers.
   2. Contractor is responsible to field verify neck sizes and installation requirements for all diffusers indicated for replacement on the drawings prior to ordering units.

B. Related Sections:
   1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

PART 2 PRODUCTS

2.01 GRILLES, REGISTERS, DIFFUSERS

A. Grilles, Registers, Diffusers:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Anemostat
      b. Carnes.
      c. Hart & Cooley Inc.
      d. Krueger.
      e. METALAIRE, Inc.
      f. Nailor Industries Inc.
      g. Price Industries.
      h. Titus.
      i. Tuttle & Bailey.

2.02 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

3.02 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design

requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.03 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713 23 3713

SECTION 23 7416
PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 2 PRODUCTS

1.01 CASING

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

1.02 FANS

1.03 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

1.04 COMPRESSORS

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

1.05 AIR FILTERS:

1.06 ROOF CURBS

END OF SECTION 23 7416

SECTION 23 8239
CABINET UNIT HEATERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes cabinet unit heaters with centrifugal fans and hot-water coils.

B. Cabinet unit heaters with centrifugal fans and electric heating coils.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, and details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include location and size of each field connection.
   4. Include details of anchorages and attachments to structure and to supported equipment.
   5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
   6. Indicate location and arrangement of piping valves and specialties.
   7. Wiring Diagrams: Power, signal, and control wiring.
   8. Color chart with manufacturer standard colors.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (for Hydronic Unit Heaters)
   1. Airedale by Modine.
   2. Daikin.
   3. Johnson / YORK.
   4. Sterling Commercial Hydronics.
   5. Trane.
   6. Vulcan.
   7. Zehnder Rittling.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (for Electric Unit Heaters)
   1. Berko; Marley Engineered Products.
   2. Brasch Manufacturing Co., Inc.
   3. Chromalox, Inc.
   4. Dunham-Bush, Inc.
   5. INDEECO.
   6. Markel Products; TPI Corporation.
   7. QMark; Marley Engineered Products.

2.02 DESCRIPTION

A. Factory-assembled and -tested unit complying with AHRI 440.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.03 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.04 COIL SECTION INSULATION

A. Insulation Materials: ASTM C 1071; surfaces exposed to airstream shall have erosion-resistant coating to prevent erosion of glass fibers.
   1. Thickness: 1/2 inch.
   2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
   3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
   4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.

2.05 **** [OR] ******

A. Insulation Materials: Comply with NFPA 90A or NFPA 90B. Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.
   1. Thickness: 1/2 inch.
   2. Thermal Conductivity (k-Value): 0.24 Btu x in./h x sq. ft. at 75 deg F mean temperature.
   3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.
   4. Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.06 CABINETS

A. Vertical Unit, Exposed Front Panels: Minimum 18-gauge galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.

B. Horizontal Unit, Exposed Bottom Panels: Minimum 18-gauge galvanized sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.

C. Recessed Flanges: Steel, finished to match cabinet.

D. Finish: Baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

E. Control Access Door: Key operated.

F. Accessories for Vertical Units:
   1. Base: Minimum 16-gauge steel, finished to match cabinet, nominal 4 inches high with leveling bolts.
   2. False Back: Minimum 18-gauge galvanized steel, finished to match cabinet.

2.07 FILTERS

A. Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
   1. Washable Foam: 70 percent arrestance and MERV 3.

2.08 COILS

A. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

B. Electric-Resistance Heating Coil: Nickel-chromium or stainless steel finned tubular type, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection.

2.09 CONTROLS

A. Fan and Motor Board: Removable.
   1. Fan: Forward curved, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
   2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
   3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

B. Control devices and operational sequences are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

C. Electrical Connection: Factory-wired motors and controls for a single field connection.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive cabinet heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping and electrical connections to verify actual locations before cabinet heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install cabinet heaters to comply with NFPA 90A.

B. Suspend cabinet heaters from structure with elastomeric hangers.

C. Install clean filters in each cabinet heater within two weeks of Substantial Completion.

3.03 CONNECTIONS

A. Piping installation requirements are specified in Section 232113 "Hydronic Piping," Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Comply with safety requirements in UL 1995.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

END OF SECTION 238239.13 23 8239

SECTION 26 0500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Basic Requirements.
   2. Detailed Requirements.
   3. Coordination.
   4. Quality Assurance.
   5. Codes, Ordinances, & Permits.
   6. Common requirements for electrical installation.
   7. Excavating & Backfilling.
   8. Painting.
   9. Cleaning & Rubbish

1.03 SUBMITTALS

A. Product Data:
   1. Sleeves for raceways & cables.
   2. Sleeve seals.
   3. Grout.
   4. Firestopping.

B. Shop Drawings:
   1. Submit shop drawings, wiring diagrams, and descriptive literature on all equipment furnished in this contract. Contractor shall “approve” shop drawings as specified in Division 1 prior to submitting to Engineer for approval. Shop drawing submittals shall comply with Division 1 requirements.
   2. Make submittals as soon as practicable after the signing of the contract. Shipment shall not be released until drawings and literature have been finally approved.
   3. Shop drawings shall be checked by the Contractor for shape, dimensions, and details of attachment to the construction before submittal. Submitted shop drawings will be presumed to have been so checked by the Contractor.
   4. The literature shall be complete, giving materials, gauges, weights, finishes, etc., and in case of lighting fixtures, shall include ETL photometric curves.
   5. Number of copies required is the number of copies the Contractor desires returned, or the quantity listed in Division 1, whichever is greater.
   6. Wiring diagrams shall be furnished for all communication and control systems under this contract.
   7. In addition to the foregoing, the Contractor is to supply to the General Contractor, for delivery to the Owner, bound in a single set, a complete shop drawing portfolio of all equipment indicated under the specific specification section. Submit these near completion of the project arranged and indexed according to the CSI format.

C. Test reports: Submit written installation test reports for review and approval immediately after testing has been satisfactorily completed.

D. Acceptance certificates: Submit written manufacturer, testing agency and/or local Code authority acceptance certificates with project closeout documentation.

E. Warranty: Submit a written warranty statement detailing all system and equipment warranties. Warranty shall be signed by Submittals are not required for this Section.

F. Operation & Maintenance Instructions:
   1. Refer to Division 1 for submittal and training requirements.

2. Furnish approved operation and maintenance instruction booklets covering each listed item of equipment installed under this contract. These booklets shall provide complete instructions on the proper operation, use and periodic maintenance, together with the source of replacement parts and service for the item of equipment covered.
3. Operation and maintenance manuals shall include copies of test reports, acceptance certificates and warranty information.
4. In addition to the foregoing, the Contractor shall demonstrate to the Owner's designated personnel the use of the systems listed herein and shall furnish three (3) typewritten copies of a general operation procedure. Include locations and functions of switches, circuit breakers, fuses, etc.
5. After final acceptance of all work and occupancy of the building, the Contractor shall have on the job, a qualified representative to make final adjustments of electrical systems and to instruct the Owner's representative in operating procedures, adjustment, and maintenance of system components, and to acquaint the Owner's representative with locations and functions of circuit breakers, fuses, switches, control devices, etc.

G. Record Drawings:
1. Refer to Division 1 for submittal requirements.
2. The Architect/Engineer will furnish one (1) set of blue line prints of the building floor plan for the Contractor's use in making a record layout of actual locations of equipment, devices, routing of conduits and locations of pull boxes for the following facilities:
   a. Electrical feeders to substations and branch circuit panels
   b. All branch circuit wiring
   c. Voice/data conduit system
   d. Empty conduits for use by others
3. The information shall be neatly marked and the prints delivered to the Architect.

H. Contractor's Warranty:
1. All work shall be warranted to be free of defects and to function properly for one year from the date of final acceptance or beneficial occupancy, whichever shall occur first. Defects appearing within the warranty period shall be repaired to the satisfaction of the Architect/Engineer. Refer to Division 1 for additional requirements.
2. The warranty shall not obligate the Contractor for failure resulting from accident or from improper operation or care on the part of the Owner.
3. Warranty for drivers and LEDs shall be as follows: Warranty failure shall be deemed to have occurred when 10% or more of the population of drivers or LED boards have failed. Should this occur, it is necessary that the Owner (or Contractor prior to substantial completion) make timely notification of the Architect/Engineer to facilitate a warranty claim with the manufacturer(s). Any extended warranties offered by Manufacturers shall not be preempted by this warranty.

1.04 BASIC REQUIREMENTS

A. Before bidding, the Contractor. Extended warranties and manufacturer based warranties shall diligently study and compare all contract documents and shall be signed by the warranty holder and promptly report to the Architect/Engineer any discrepancies or deficiencies discovered by or made known to the Contractor.

B. Discrepancies: Whenever a discrepancy or inconsistency exists between related information indicated on the contract drawings and/or specifications (such as differences between product descriptions and catalog numbers) this contractor shall obtain additional clarification and direction from the Architect/Engineer before proceeding. For bidding purposes, this contractor shall include warranty terms the labor and materials necessary to comply with the alternative that results in the greatest cost to the Contract.

C. Deficiencies: The Contractor and subcontractors shall resolve all known deficiencies and inadvertent omissions, including non-compliance with applicable codes, with the Architect/Engineer prior to ordering materials or proceeding with the work. Any work performed prior to receipt of instruction from the Architect/Engineer will be done so at the Contractor’s risk.

D. Manufacturer's Catalog Numbers: Product series, model, or catalog numbers, whether indicated on drawings or specifications, shall not be considered complete. This Contractor shall not order any product based solely upon the stated catalog number. Furnish products including accessories and options necessary to match the full product description and its intended purpose and application based on all information available from the contract documents.

1.05 DETAILED REQUIREMENTS

A. Equipment and material specifications are minimum general requirements.

B. In cases where construction requirements and/or special features not mentioned are stated in subsequent sections, on the drawings, or by local Code, the higher standard shall apply.

C. Coordinate rough-in work and other electrical provisions for temperature sensors, CO2 sensors, humidistats, thermostats, and other wall-mounted BMS wired devices shown on the mechanical drawings. Refer to the mechanical plans and the mechanical symbols list to identify such items. Install a junction box with a plaster ring with pathway to equipment, unless otherwise indicated on mechanical drawings or specifications. Coordinate exact requirements with the contractor providing the wired device.

D. Electrical installations shall not hinder the regular maintenance of or replacement of mechanical equipment. Conduit and cabling shall not be installed beneath suspended mechanical units. Coordinate and plan installations.

1.06 DEMOLITION REQUIREMENTS

A. This contractor shall visit the site to verify existing conditions and limitation information prior to submitting a bid. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and the scope of work.

B. Remove, relocate, and extend existing installations to accommodate new construction on existing project site.

C. Existing wiring to be removed under this contract within the defined scope of demolition shall be regarded as scrap materials to be recycled by this Contactor. Scrap value shall be determined by the Contractor and accounted for in the Contractor's bid. All other demolished electrical items (e.g., light poles, luminaires, switchgear, etc.) shall be regarded as the Owner's property. The Owner reserves the right to identify which items shall be salvaged-and, thus, carefully removed by this Contractor and placed in storage on site as directed by the Owner. The Contractor shall be responsible for the proper disposal of all demolished materials that the Owner does not want to salvage. Coordinate exact requirements directly with Owner.

D. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities, equipment, light poles, etc. that remain in operation. Extension of conduit and wire to equipment shall be compatible with the surrounding area.
   1. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel and/or junction boxes as appropriate.
   2. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
   3. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
   4. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

E. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
   1. Ballasts in light fixtures installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide Owner and Architect/Engineer with a Certificate of Destruction to

verify proper disposal.

2. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in a permitted hazardous waste disposal facility or by a permitted lamp recycler.

1.07 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, and wireways will be clear of obstructions and of the working and access space of other equipment.

B. Prior to bidding, this contractor shall determine conduit and cabling routings, including the means and methods of installation, maximum feeder/branch-circuit lengths, pull boxes, junction boxes, conduit bodies, fittings, and any other related work in accordance with the contract documents and the applicable building codes.

C. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

D. 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.”

1.08 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

B. Tests & Adjustments
   1. Contractor shall perform at his own expense, except for electrical energy, any tests that the Architect/Engineer may order to prove the performance of any device(s) and/or equipment supplied under this contract.
   2. Such tests will be limited to non-destructive test and will involve only direct reading(s) of the parameter(s) involved, i.e., actual trip rating or time delay of a circuit breaker may be required but coordination study is beyond the scope of this requirement.
   3. Provide adjustments such as branch circuit re-arranging, circuit breaker trip settings, final selection of fuse sizes, motor starter overload element settings, and the like that may be indicated by the tests and/or to suit equipment to be installed.

1.09 CODES, ORDINANCES, & PERMITS

A. All governmental codes and ordinances that are applicable and in effect at the time and location of this work are hereby referenced as an integral part of the specification to establish minimum standards of design detail, materials, and workmanship. Extra payment will not be allowed for work or changes required by local code enforcement authorities and/or utility companies. This is not to preclude the establishment of non-conflicting higher standards as may be specified herein and/or indicated on the drawings. In case of conflict between any of the standards established herein and a governmental code or ordinance, refer to the Architect/Engineer and obtain instructions before proceeding with the work involved.

B. Apply for, obtain, and pay for required permits and certificates of inspection

C. Particular attention is directed to:
   1. National Electrical Code
   2. Local electric wiring ordinances
   3. IEEE National Electrical Safety Code
   4. Hawaii Electric codes and standards

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. In all Division 26 Part 2 articles where titles introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified or prior approved product substitution. No product manufacturer will be accepted after this bid unless approved through a contractual change or written acceptance by Engineer. See “Substitutions” article herein.

2.02 PROPRIETARY REFERENCES

A. Except where there is indication to the contrary, the intent of this specification is to be open to all brand names and suppliers that offer equipment that complies with the stated requirements of capacity, function, quality configuration, size, shape, and operating characteristics that are compatible with the design objectives of the system and interfacing equipment.

B. Stated requirements are minimum in the case of unit output and maximum in the case of input requirements.

C. The perceived operational limitations and maintenance requirements as well as the availability of suitable maintenance support will be evaluated in comparison to competing equipment as an important factor in deciding if an item of equipment is acceptable or not acceptable.

D. The product manufacturers listed are manufacturers that are believed to be producers of like equipment or materials and locally represented, with service capability and otherwise meeting the requirements of the contract documents. Reference to a brand name is not to be construed as a representation that the named supplier actually has available the equipment or materials that meet the detailed requirements of the contract documents.

E. Details of construction, control, or operation that are proprietary and not significant to the Owner's utilization of the equipment will not be used as a basis for qualifying or disqualifying any equipment.

2.03 SUBSTITUTIONS

A. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

B. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Engineer at least 10 days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the work including changes in the work of other contracts that incorporation of the proposed substitution would require shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Engineer's decision of approval or disapproval of a proposed substitution shall be final. Refer to Division 1 for additional requirements.

C. If the Engineer approves a proposed substitution prior to receipt of bids, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

D. No substitutions will be considered after the contract award unless specifically provided in the contract documents.

2.04 UL LABEL

A. All materials, devices, etc. installed under this contract shall bear the UL label, or be UL listed as applicable except those specified items not covered by existing UL Standards.

PART 3 EXECUTION

3.01 BUILDING CONSTRUCTION

A. Refer to the general construction drawings, which are bound with the drawings of this work, for construction details, elevations, etc.

3.02 INSPECTION OF SITE

A. Determine information regarding existing construction by the site inspection prior to bidding.

B. By submitting a bid for this work, contractor agrees he has inspected the existing site and familiarized himself with existing conditions and how they relate to the contract documents.

3.03 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Examine the site and all the drawings before proceeding with the layout and installation of this work. Verify all door swings and clearances to cabinets, etc. before locating switch and outlet boxes. Locate conduits, boxes, etc., essentially as shown on the drawings, but in exact layout determined on the job to suit actual conditions. Locate work so it does not interfere with access to service for any equipment. Confer and cooperate with other trades on the job so all parts will be installed in proper relationship. Precise location of parts to coordinate with other work is the responsibility of the Contractor.

B. Obtain and follow manufacturer's installation instructions in the installation of all electrical equipment. Observe all restrictions imposed by the equipment manufacturer, UL label, NEC, or other applicable code in regard to setting; anchoring; hanging; clearances; electric, magnetic or thermal separation; shielding; weather and moisture protection. In case of conflict between the specifications herein and instructions or code governing the installation, notify the Architect/Engineer and receive his instructions before proceeding.

C. Arrange exposed work as closely as practicable to wall or ceiling surfaces and in accurate alignment with exposed features of structure and/or trim. Locate concealed work so fittings, connectors, and other projections will clear surfaces. Where the option of more than one material is given, selection shall be confined to those which may be properly installed.

D. Install all work in a neat and workmanlike manner by workmen thoroughly qualified in the trade or duties they are to perform. Rough work will be rejected.

E. The Contractor is responsible for correct size and location of chases, slots, and openings require and will be liable for any cutting or patching made necessary by his failure to make proper arrangements in this respect.

F. Maintain a competent full-time superintendent on the job to oversee and coordinate work with other trades, receive instructions from the Architect/Engineer, make layout of work to suit actual conditions, and to satisfy requirements of the drawings, specifications, and good workmanship.

3.04 EXCAVATING & BACKFILLING

A. Provide excavating and backfilling necessary for installation of this work.

B. Dig trenches to proper depth, graded for fall and to give solid bearing for each length of conduit or wire. Underground conduit or wire shall not be covered until inspected and the installation approved.

C. Trenches under the building and under concrete slabs around the building shall be backfilled with mechanically tamped sand to level with surrounding earth. Dirt backfill shall not be used for these trenches.

D. Before starting any excavation, use every reasonable means (examination of drawings, check with local utility companies and completed site work, local inquiry and check of surface indications) to determine the presence of underground piping, wiring, etc. in the area to be excavated. If such are, or are suspected to be existing, obtain instructions from the Architect/Engineer before proceeding.

E. Refer to Division 31 for additional excavating, trenching and backfilling requirements.

F. Contractor shall verify, smooth or refill and reseed any settlement areas or mounded areas of trenching after one winter.

3.05 PAINTING

A. Exposed electrical work in unfinished areas will require painting unless noted otherwise.

B. Protect the manufacturer's finish on equipment that is so finished. Clean and/or touch-up as necessary to repair damage at the end of the job.

C. Paint exposed work installed under this contract with suitable primer and two coats of approved enamel, colors as specified or directed.

D. Protect the manufacturer's finish on equipment that is so finished. Clean and/or touch-up as necessary to repair damage at the end of the job.

3.06 CLEANING & RUBBISH

A. During the work, keep the premises clear of unnecessary accumulation of debris.

B. Plug or cap open ends of conduits to prevent the entrance of dirt and/or moisture during construction. Protect boxes, panel enclosures, etc. against the entrance of mortar, plaster, moisture, and other foreign material during construction, and thoroughly clean these spaces before pulling wires, and again, if necessary, before installing covers of fronts.

C. On completion of the work, remove all rubbish and debris resulting from the work or the work of subcontractors and dispose of same.

D. All equipment, fixtures, etc. shall be thoroughly cleaned of accumulated dust, plaster, or other dirt and left in a satisfactory condition for use.

END OF SECTION 26 0500

SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Architect before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.
   1. Plan the installation of work so that interruptions of services to the building are kept to a minimum, and such interruptions shall occur at owner's conveniance.
   2. Interruptions shall be for as short of duration as possible.
   3. Service shutdown shall not commence without owner approval. Contractor shall obtain permission from the owner to shut off services to any location by notification in writing a minimum of two weeks prior to shutdown. Notification shall include the reason for and duration of the service shutdown.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify local fire service.

F. Existing Communications Systems: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Refer to electrical abbreviations on drawings for demolition tag descriptions: "E","R","RR", etc

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Remove abandoned surface mounted raceway. Where existing surface mounted raceway is installed and devices are shown to be removed, coordinate device removal with existing devices to remain. If removal of a device will effect the installation of remaining devices, notify

the engineer prior to demolition.

F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank Stainless Steel cover for abandoned junction boxes.

G. Disconnect and remove abandoned panelboards and distribution equipment.

H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

I. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

L. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION 26 0505

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

1.02 RELATED REQUIREMENTS

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

B. Section 07 8400 - Firestopping.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

D. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers 2005 (Reapproved 2021).

E. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation 2018.

F. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

H. NECA 104 - Standard for Installing Aluminum Building Wire and Cable 2012.

I. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable 2018.

J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.

K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

Q. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70/ICEA S-95-658.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

H. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
      a. Substitution of aluminum conductors for copper is permitted only for the following:
         1) Feeders: Copper conductors size #4 AWG and larger.
      b. Where aluminum conductors are substituted for copper, comply with the following:
         1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
         2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

I. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20A, 120 V circuit longer than 100 ft (30 m): 10 AWG. for voltage drop.

J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.06 ACCESSORIES

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. Electrical Tape:
   1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.

4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

G. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

J. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
a. Use listed fittings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

K. Install conductors with a minimum of 6-inches (15 cm) of slack at each outlet.

L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

P. Insulate ends of spare conductors using vinyl insulating electrical tape.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION 26 0519

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

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

B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Concrete-Encased Electrode(For new service installation):

a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

3. Ground Ring(For new service installation):
   a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches (750 mm).
4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.
3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
   b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
   c. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

I. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   b. Metal gas piping.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).
      b. Where bare copper conductors are used for grounding systems, they shall comply with the following:
         1) Solid Conductors: ASTM B 3.
         2) Stranded Conductors: ASTM B 8.
         3) Tinend Conductors: ASTM B 33.
         4) Bonding Cable: 28 KCMIL, 14 strands of No. 17 AWG conductors, 1/4 inch in diameter.
         5) Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
         6) Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
         7) Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
   3. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
   4. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Grounding Bus:
   1. Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

G. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

H. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
      a. Applications:
         1) Underground connections(except at test wells and as otherwise indicated.
         2) Connections to structural steel.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
      a. Applications:
         1) Pipe and equipment grounding conductor terminations.

I. Identify grounding and bonding system components in accordance with Section 26 0553.

3.02 EQUIPMENT GROUNDING:

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.03 GROUNDING AT THE SERVICE:

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Tests and Inspection: After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions
   2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
      a. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
      b. Perform tests by fall-of-potential method according to IEEE 81.
   3. Prepare dimensioned drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
      a. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
   4. Prepare test and inspection reports. Report measured ground resistances that exceed the following values:
      a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
      b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   5. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
   6. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION 26 0526

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

B. Construction requirements for concrete bases

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.
   2. Channel Material:
      a. galvanized steel.
   3. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts.
   3. Solid or Grout-Filled Masonry: Use expansion anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam clamps complying with MSS SP-96.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood: Use Fasten with lag screws or through bolts.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Strength and support assemblies: where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
   2. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
   3. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   4. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   5. Use slotted-channel racks attached to substrate to support equipment surface-mounted on hollow stud wallsand nonstructual building surfaces.
   6. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   7. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000 and as specified in this section.
   8. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
   9. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.
   10. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION 26 0529

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Surface Mounted Raceways

H. Conduit fittings.

I. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 8400 - Firestopping.

C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0533.23 - Surface Raceways for Electrical Systems.

H. Section 26 0539 - Underfloor Raceways for Electrical Systems.

I. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

J. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

K. Section 31 2316 - Excavation.

L. Section 31 2323 - Fill: Bedding and backfilling.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.
   2. Exterior, Direct-Buried: Use rigid PVC conduit.
   3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

D. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use intermediate metal conduit (IMC).

H. Exposed, interior, Located within finished spaces: Use Decorative Surface Mounted Raceway

I. Exposed, Interior, Not Subject to Physical Damage, Located within unfinished spaces(mechanical rooms/storage rooms): Use electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

K. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

M. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.
      c. Pneumatic Equipment
      d. Electric Solenoids.
      e. Hydraulic equipment.

N. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 SURFACE MOUNTED RACEWAYS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

D. Surface Metal Raceways: Listed and labeled as complying with UL 5.

E. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.

F. Multioutlet Assemblies: Listed and labeled as complying with UL 111.
   1. Color: To be selected by architect prior to product order.
   2. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

G. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Install raceways square to enclosures and terminate with locknuts.
   5. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   6. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   7. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   8. Arrange conduit to maintain adequate headroom, clearances, and access.
   9. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
   10. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
   11. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
   12. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.
      b. Hot water piping.
      c. Flues.
   13. arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Support conduits within 12 inches of connected enclosure.

I. Connections and Terminations:
   1. Use approved conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   5. Terminate threaded conduits in boxes and enclosures using threaded hubs for dry locations and raintight hubs for wet locations.
   6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
   7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

8. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

K. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.
2. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length.
3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
3. Where conduits penetrate coolers or freezers.

N. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

O. Provide grounding and bonding in accordance with Section 26 0526.

P. Surface Raceway Installation:
1. Install surface raceway with a minimum 2-inch radius control at bend points.

2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section.
3. Support raceway according to manufacturers written instructions. Tape and glue are not acceptable support methods.

END OF SECTION 26 0533.13

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use raised covers suitable for the type of wall construction and device configuration where required.
   4. Use shallow boxes where required by the type of wall construction.
   5. Do not use "through-wall" boxes designed for access from both sides of wall.
   6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   8. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
   9. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
   10. Minimum Box Size, Unless Otherwise Indicated:

a. 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size

11. Wall Plates: Comply with Section 26 2726.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Mount at heights indicated on drawings. If mounting heights are not individually indicated, Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as requiredwhere approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes so that wall plates do not span different building finishes.
4. Locate boxes so that wall plates do not cross masonry joints.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

I. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
5. Do not support boses by conduit alone.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 26 0526.

R. Identify boxes in accordance with Section 26 0553.

END OF SECTION 26 0533.16

SECTION 26 0533.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface raceway systems.

B. Wireways.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0533.13 - Conduit for Electrical Systems.

D. Section 26 0533.16 - Boxes for Electrical Systems.

E. Section 26 2726 - Wiring Devices: Receptacles.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

3.02 APPLICATION:

A. Unless indicated on drawings, provide surface mounted raceway, plug strips, or wireways only where specifically indicated or approved:

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install raceways plumb and level.

D. Surface Raceway:
   1. Install surface raceway with a minimum 2-inch radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

E. Secure and support raceways in accordance with Section 26 0529 at intervals complying with NFPA 70 and manufacturer's requirements.

F. Close unused raceway openings.

G. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION 26 0533.23

SECTION 26 0536
CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 2 PRODUCTS

1.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.

END OF SECTION 26 0536

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

B. Section 27 1000 - STRUCTURED CABLING: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace 2021.

E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components. Provide unique idenfication for all branch loads served.
      a. Switchgear:
         1) Use identification nameplate to identify load(s) served for each branch device.
      b. Switchboards:
         1) Use identification nameplate to identify load(s) served for each branch device.
      c. Motor Control Centers:
         1) Use identification nameplate to identify load(s) served for each branch device.
      d. Panelboards:
         1) Use typewritten circuit directory in location provided by panelboard manufacturer to identify load(s) served for panelboards with a door.Identify spares and spaces.
         2) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      e. Transformers:
         1) Identify kVA rating.
         2) Identify voltage and phase for primary and secondary.

3) Identify power source and circuit number. Include location when not within sight of equipment.
4) Identify load(s) served. Include location when not within sight of equipment.

f. Enclosed switches, circuit breakers, and motor controllers:

g. Time Switches:

1) Identify load(s) served and associated circuits controlled. Include location.

h. Enclosed Contactors:

1) Identify load(s) and associated circuits controlled. Include location.

i. Centralized Emergency Lighting Inverters:

j. Transfer Switches:

1) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Emergency System Equipment:

a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.

5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

7. Use floor marking tape to identify required equipment working clearanceswithin mechanical or electrical equipment rooms. Do not install within finished spaces..

8. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

a. Service equipment.

9. Arc Flash Hazard Warning Labels: Use warning labels meeting the requirements of NFPA 70 to identify arc flash hazards.

a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).

b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

c. Service Equipment: Include the following information in accordance with NFPA 70.

1) Nominal system voltage.
2) Available fault current.
3) Clearing time of service overcurrent protective device(s).
4) Date label applied.

C. Identification for Conductors and Cables:

1. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

a. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1) Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2) Colors for 208/120-V Circuits:
   (a) Phase A: Black.
   (b) Phase B: Red.
   (c) Phase C: Blue.
3) Colors for 480/277-V Circuits:
   (a) Colors specified in first three subparagraphs below are generally used for phase conductors at this voltage.
   (b) Phase A: Brown.
   (c) Phase B: Orange.
   (d) Phase C: Yellow.
4) Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

2. Identification for Communications Conductors and Cables: Comply with Section 27 1000.
3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
4. Use underground warning tape to identify direct buried cables.

D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
   a. For exposed boxes in public areas, use only identification labels.
3. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
   a. For receptacles in areas as directed by Architect, provide identification on inside surface of wallplate. Verify with Architect prior to label application.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use stainless steel or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
   a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
      a. Use only for indoor locations.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1.5 inches (38 mm) by 3 inches (76 mm).
   2. Legend:
      a. System designation where applicable:
         1) Emergency Power System: Identify with text "EMERGENCY".
         2) Fire Alarm System: Identify with text "FIRE ALARM".
      b. Equipment designation or other approved description.
      c. Other information as indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1/2 inch (13 mm).
      b. Equipment Designation: 1/2 inch (13 mm).
      c. Other Information: 1/4 inch (6 mm).
   5. Color:
      a. Normal Power System: White text on black background.

D. Format for Receptacle Identification:
   1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
   2. Legend: Power source and circuit number or other designation indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 3/16 inch (5 mm).
   5. Color: Black text on clear background.

2.03 VOLTAGE MARKERS

A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

C. Legend:
   1. Markers for Voltage Identification: Highest voltage present.
   2. Markers for System Identification:
      a. Emergency Power System: Text "EMERGENCY".

D. Color: Black text on orange background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
   1. Tape for Buried Power Lines: Black text on red background.
   2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches (76 mm) wide, with alternating black and white stripes.

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, drawings, shop drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout project.

C. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Enclosure front.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

D. Install identification products centered, level, and parallel with lines of item being identified.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Unless labels and nameplates are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

G. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

H. Install underground warning tape above buried lines with one tape per trench at 6 inch(es) (mm) below finished grade.

I. Secure rigid signs using stainless steel screws.

J. Mark all handwritten text, where permitted, to be neat and legible.

K. Conductors To Be Extended in the Future: Attach write-on tags to conductors and list source.

L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

M. Equipment To Be Labeled:
   1. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
   2. Enclosures and electrical cabinets.
   3. Access doors and panels for concealed electrical items.
   4. Switchboards.
   5. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   6. Substations.
   7. Emergency system boxes and enclosures.
   8. Motor-control centers.
   9. Enclosed switches.
   10. Enclosed circuit breakers.
   11. Enclosed controllers.
   12. Variable-speed controllers.
   13. Push-button stations.
   14. Power-transfer equipment.
   15. Contactors.
   16. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION 26 0553

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor motion sensors.

C. Time switches.

D. In-wall time switches.

E. In-wall interval timers.

F. Outdoor photo controls.

G. Daylighting controls.

H. Lighting contactors.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
   1. Includes finish requirements for wall controls specified in this section.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices current edition.

B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2008 (Reaffirmed 2020).

G. NEMA ICS 6 - Industrial Control and Systems: Enclosures 1993 (Reaffirmed 2016).

H. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control Current Edition, Including All Revisions.

I. UL 916 - Energy Management Equipment Current Edition, Including All Revisions.

J. UL 917 - Clock-Operated Switches Current Edition, Including All Revisions.

K. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules Current Edition, Including All Revisions.

L. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Provide lighting plan indicating location, model number, and orientation of each sensor and associated system component.

D. Field Quality Control Reports.

E. Operation and Maintenance Data: Include detailed information on device programming and setup.

F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all sensors.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic

technologies.

d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Sensitivity: Field adjustable.
9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
13. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect and Engineer.
14. Wireless Sensors:
    a. RF Range: 30 feet (9 m) through typical construction materials.
    b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
    c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
    c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    e. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
    b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
d. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

E. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
c. Finish: White unless otherwise indicated.

F. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
a. Provide field selectable setting for disabling LED motion detector visual indicator.
b. Finish: White unless otherwise indicated.

G. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.

H. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on drawings.

I. Power Packs for Wireless Occupancy Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
2. Input Supply Voltage: Dual rated for 120/277 V ac.
3. Load Rating: As required to control the load indicated on drawings.

J. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

2.03 OUTDOOR MOTION SENSORS

A. Manufacturers:
1. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
2. Lithonia Lighting: www.lithonia.com/#sle.

B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.

E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

F. Integral Photocell: For dusk to dawn operation.

G. Manual Override: Activated by switching power off to unit and then back on.

H. Load Rating: As indicated on drawings and schedules.

I. Coverage: As indicated on drawings and schedules.

J. Finish: As indicated on drawings and schedules.

2.04 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. Digital Electronic Time Switches:
   1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability:
      a. Astronomic Time Switches: Four channel, capable of different schedule for each day of the weekwith additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
   3. Schedule Capacity: Not less than 16 programmable on/off operations.
   4. Provide automatic daylight savings time and leap year compensation.
   5. Provide power outage backup to retain programming and maintain clock.
   6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
   7. Provide remote photocell input.
   8. Input Supply Voltage: As indicated on the drawings.
   9. Output Switch Configuration: As required to control the load indicated on drawings.
   10. Output Switch Contact Ratings: As required to control the load indicated on drawings.
   11. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
      a. Indoor clean, dry locations: Type 1.
      b. Outdoor locations: Type 3R.

2.05 IN-WALL TIME SWITCHES

A. Digital Electronic In-Wall Time Switches:
   1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability:
      a. 7-Day Time Switches: Capable of different schedule for each day of the week.
   3. Schedule Capacity: Not less than 40 programmable on/off operations.
   4. Provide power outage backup to retain programming and maintain clock.
   5. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
   6. Switch Configuration: Suitable for use in either SPST or 3-way application.
   7. Contact Ratings: As required to control the load indicated on drawings.

2.06 IN-WALL INTERVAL TIMERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. Digital Electronic In-Wall Interval Timers:
   1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability: Designed to turn load off at end of preset time interval.
   3. Time Interval: Field selectable range of presets available up to 12 hours.
   4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
   5. Provide power outage backup to retain programming and maintain clock.

6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
7. Switch Configuration: Suitable for use in either SPST or 3-way application.
8. Contact Ratings: As required to control the load indicated on drawings.

2.07 OUTDOOR PHOTO CONTROLS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. Stem-Mounted Outdoor Photo Controls:
   1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
   2. Housing: Weatherproof, impact resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   5. Voltage: As required to control the load indicated on the drawings.
   6. Failure Mode: Fails to the on position.
   7. Load Rating: As required to control the load indicated on the drawings.
   8. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

C. Button Type Outdoor Photo Controls
   1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
   2. Housing: Weather resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   5. Voltage: As required to control the load indicated on the drawings.
   6. Failure Mode: Fails to the on position.
   7. Load Rating: As required to control the load indicated on the drawings.

2.08 DAYLIGHTING CONTROLS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
   1. Sensor Type: Filtered silicon photo diode.
   2. Finish: White unless otherwise indicated.
   3. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect and engineer.
   4. Wireless Daylighting Control Photo Sensors:
      a. RF Range: 30 feet (9 m) through typical construction materials.
      b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
      c. Power: Battery-operated with minimum ten-year battery life.

D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.

2.09 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refer to drawings and controls schedules for listed manufacturers.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
   1. Disconnects: Circuit breaker or disconnect switch type as indicated.
      a. Disconnect Switches: Fusible or nonfusible type as indicated.
      b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
      c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

D. Short Circuit Current Rating:
   1. Provide contactors with listed short circuit current rating as indicated on the drawings.

E. Enclosures:
   1. Comply with NEMA ICS 6.
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
      b. Outdoor Locations: Type 3R or Type 4.
   3. Finish: Manufacturer's standard unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
      b. In-Wall Interval Timers: 48 inches (1.2 m) above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.

G. Provide required supports in accordance with Section 26 0529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 0553.
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
   2. Install and aim sensors in locations to achieve complete coverage. Do not exceed coverage limits specified in manufacturer's written instructions.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Daylighting Control Photo Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
   2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
   3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

N. Combination Enclosed Lighting Contactors:
   1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
   2. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

O. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

P. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

Q. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 0533.16 for mounting of lighting control device system components.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Inspect each lighting control device for damage and defects.

D. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test

results in written report to be included with submittals.

E. Test time switches to verify proper operation.

F. Test outdoor photo controls to verify proper operation, including time delays where applicable.

G. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

H. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.03 ADJUSTING

A. Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

B. Adjust devices and wall plates to be flush and level.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.04 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Manufacturer's authorized service representative.
   3. Location: At project site.

END OF SECTION 26 0923

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

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

B. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 4300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

E. NEMA PB 1 - Panelboards 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

K. UL 67 - Panelboards Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

O. UL 1699 - Arc-Fault Circuit-Interrupters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective deviceupon request.
   2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Include evidence of NRTL listing for series rating of installed devices.
   6. Include evidence of NRTL listing for SPD as installed in panelboard.
   7. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   8. Include documentation of listed series ratings upon request.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:
   1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
   2. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
   3. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

E. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A and labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with oneor more main service disconnecting and overcurrent protection devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

F. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
   1. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

H. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Material: Tin-plated aluminum.
      a. Plating shall run entire length of bus.
      b. Bus shall be fully rated the entire length.
   2. Provide fully rated neutral bus, with a suitable lug for each feeder or branch circuit requiring a neutral connection. Equip with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
   3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

I. Conductor Terminations: Suitable for use with the conductors to be installed.
   1. Material: Tin-plated aluminum.
   2. Terminations shall allow use of 75 deg C rated conductors without derating.

3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators:Mechanical type, with a lug on the bar for each pole in the panelboard.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1.
b. Outdoor Locations: Type 3R.
c. Kitchen/Wash-Down areas:.Type 4X
2. Boxes: Galvanized steel unless otherwise indicated.
a. Provide wiring gutters sized to accommodate the conductors to be installed.
b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
3. Fronts:
a. Secured to box with concealed trim clamps.
b. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
c. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening and cover all live parts with no exposed hardware.
d. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat
4. Height: 84 inches maximum.
5. Lockable Doors: All doors lockable with locks keyed alike unless otherwise indicated.

K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
1. Percentage of future capacity: Five percent.

L. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list and label panelboards as a complete assembly including surge protective device.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

N. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Circuit Breakers:
1. Provide bolt-on type.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.
3. Provide electronic trip circuit breakerswhere indicated.

C. Enclosures:
1. Provide surface-mounted or flush-mounted enclosuresas indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

C. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Applications Allowed: Provide load centers only for where indicated by drawings.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosuresas indicated.
   2. Fronts: Providelockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide circuit directory label on inside of door.

2.06 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugsunless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 250 amperes and larger.
      b. Provide interchangeable trip units where indicated.
   5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

B. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

C. Provide the following circuit breaker types where indicated:
   1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   2. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
   3. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

D. Do not use handle ties in lieu of multi-pole circuit breakers.

E. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

F. Provide the following features and accessories where indicated or where required to complete installation:
   1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
   2. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
   1. For required ICC A117.1 accessible load centers and panels, install panels such that the highest position of any operating handle for circuit breakers or switches does not exceed 48 inches (2000 mm) above the floor or working platform.

I. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.

J. Provide minimum of 4 spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.

K. Provide grounding and bonding in accordance with Section 26 0526.

L. Install all field-installed branch devices, components, and accessories.

M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

N. Set field-adjustable circuit breaker tripping function settings as indicated.

O. Provide filler plates to cover unused spaces in panelboards.

P. Identification:
   1. Identify panelboards in compliance with Section 26 0553 and provide the following:
      a. Identify field-installed conductors, interconnecting wiring, and components; install warning signs.
      b. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
      c. Panelboard Nameplates: Label each panelboard with a nameplate.
      d. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate.
      e. Install warning signs identifying source of remote circuit.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1for all main circuit breakers and circuit breakers larger than 100 amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, for each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

1. Measure loads during period of normal facility operations.
2. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2416

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Fan speed controllers.

D. Receptacles.

E. Wall plates.

F. Access floor boxes.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 0533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units Current Edition, Including All Revisions.

M. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.

N. UL 1917 - Solid-State Fan Speed Controls Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
   1. Wall Dimmers: Include derating information for ganged multiple devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. Provide weather resistant GFCI receptacles with specified weatherproof in use covers for receptacles installed outdoors or in damp or wet locations.

C. Provide tamper resistant receptacles.

D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

E. Provide GFCI protection for receptacles installed in commercial kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Gray with stainless steel wall plate, Verification during submittal process.

C. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate factory marked "Emergency".

2.03 MODULAR CONNECTORS

A. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.04 MANUFACTURERS:

A. Hubbell Incorporated: www.hubbell.com/#sle.

B. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

C. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

D. Eaton(Arrow Hart).

E. Substitutions: See Section 01 6000 - Product Requirements.

2.05 SOURCE LIMITATIONS

A. Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.06 PRODUCT GRADE:

A. Receptacles: Unless indicated otherwise, Industrial specification grade.

B. Switches: Unless indicated otherwise, Industrial specification grade.

2.07 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

C. Lighted Wall Switches: 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Pilot Light Wall Switches: 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.08 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

D. Provide dimmers compatible with associated lighting fixtures indicated on drawings.

2.09 FAN SPEED CONTROLLERS

A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
   1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

2.10 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   3. Tamper Resistant Convenience Receptacles: 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: [_____], duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

D. USB Charging Devices:
1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
    a. Charging Capacity - Two-Port Devices: 5 A, minimum.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A&C) USB charging device and receptacle, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

2.11 WALL PLATES

A. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel unless indicated otherwise by architect during submittal process.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section. Unless otherwise indicated, measurements are to center line of device.
1. Mounting Heights: Unless otherwise indicated, as follows:
    a. Wall Switches: +46" (1168 mm) above finished floor.
    b. Wall Dimmers: +46" (1168 mm) above finished floor.
    c. Fan Speed Controllers: +46" (1168 mm) above finished floor.
    d. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter where indicated.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
   4. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   5. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
      d. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

I. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

J. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

K. Install wiring devices plumb and level with mounting yoke held rigidly in place.

L. Install wall switches with OFF position down.

M. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

N. Do not share neutral conductor on branch circuits utilizing wall dimmers.

O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

R. Identify wiring devices in accordance with Section 26 0553.
   1. Unless instructed differently by Architect, Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.
   1. Line voltage: Acceptable range is 105 to 132 V.
   2. Ground Impedance: Values of up to 2 ohms are acceptable.
   3. Voltage Drop: Under 15A load, a value of 6 percent or higher is unnacceptable.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
   1. Test for tripping values specified in UL 1436 and UL 943

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

G. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete

3.03 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 2726

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

K. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of circuit breaker upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and

installed features and accessories.
1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation of listed series ratings upon request.

D. Closeout Submittals:
1. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
2. Project Record Documents: Record actual installed locations of enclosed circuit breakers.
3. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:
1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.

E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Provide thermal magnetic circuit breakers unless otherwise indicated.

H. Provide electronic trip circuit breakers where indicated.

I. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R.
   c. Kitchen Areas: NEMA Type 4X..
2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
3. Provide surface-mounted enclosures unless otherwise indicated.

K. Provide externally operable handle with means for locking in the OFF position.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. 14,000 rms symmetrical amperes at 480 VAC.
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Provide mechanical lugs unless otherwise indicated.
   2. Lug Material: Suitable for conductor material..

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   2. Provide interchangeable trip units.

E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

G. Provide the following circuit breaker types where indicated:
   1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   2. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

H. Provide the following features and accessories where indicated or where required to complete installation:
   1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
   2. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
   3. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage, set to operate at 35 to 70 percent of rated voltage with field-adjustable time delay to prevent nuisance tripping.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Set field-adjustable circuit breaker tripping function settings as indicated.

I. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are required.
   1. Perform insulation-resistance tests on all control wiring with respect to ground.
   2. Test functions of the trip unit by means of secondary injection.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

H. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION 26 2816.13

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.

D. Closeout Submittals:

1. Field Quality Control Test Reports.
2. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
3. Project Record Documents: Record actual locations of enclosed switches.
4. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
5. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   a. See Section 01 6000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Substitutions: See Section 01 6000 - Product Requirements.

F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Ratings:
      a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
      b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
      c. Kitchens: Type 4X.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

P. Provide the following features and accessories where indicated or where required to complete installation:
   1. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2816.16

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Lamps.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

E. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.

C. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.

E. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Disharge Ballasts 2020.

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012 (Reaffirmed 2018).

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.

J. UL 1598 - Luminaires Current Edition, Including All Revisions.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
1. LED Luminaires:
a. Include estimated useful life, calculated based on IES LM-80 test data.
2. LED Retrofit Luminaire Conversion Kits: Include list of compatible luminaires and/or criteria for compatibility.

D. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to emergency power supply for minimum of 90 minutes of rated emergency illumination.Batteries, where used, automatically recharge upon restoration of normal power source.

C. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Provide compatible accessory wire guards where indicated.
   3. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

B. Accessories:
   1. Provide compatible accessory wire guards where indicated.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to ten percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.
   a. Wall Dimmers: See Section 26 2726.
   b. Daylighting Controls: See Section 26 0923 .

2.06 LAMPS

A. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.07 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Support all fixtures independantly from ceilings and ceiling support systems.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Emergency Lighting Units and Exit Signs:

J. Identify luminaires connected to emergency power system in accordance with Section 26 0553.

K. Install lamps in each luminaire.

3.02 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.03 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

END OF SECTION 26 5100

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information 2019.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Disharge Ballasts 2020.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1598 - Luminaires Current Edition, Including All Revisions.

I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.
   b. Include IES LM-79 test report upon request.
2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
3. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.04 POLES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Finish: Match luminaire finish, unless otherwise indicated.
   3. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Pole-Mounted Luminaires:
   1. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated per electrical drawing details, in accordance with Section 03 3000.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
      e. Install anchor base covers or anchor bolt covers as indicated.
   2. Embedded Poles: Install poles plumb as indicated.
   3. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
      b. Provide supplementary ground rod electrode as per electrical drawing details and specified in Section 26 0526 at each pole bonded to grounding system as indicated.
   4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.03 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

END OF SECTION 26 5600

SECTION 27 0000
GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Division 27 Specifications are provided to define the standards and criteria to be used to bid, plan, furnish, install, test, and document communication systems for City of Reedsport Station 7 Seismic Improvements and Renovation. These specifications shall form the basis for implementation of the procurement, installation, inspection, and close-out process.

B. Division 27 has been designed and developed based on NFPA 70 (NEC), National Electrical Safety Code (NESC), Institute of Electronic and Electrical Engineers (IEEE), and a combination of ANSI/TIA Telecommunication Standards, and BICSI methodologies. The requirements within those documents are not superseded herein unless specifically stated. NEC and NESC code requirements are unable to be superseded by this document at any time. ANSI/TIA standards and BICSI methodologies are guidelines and recommendations for best practices and may be superseded, as specified, or may be made more stringent by this document.

C. Any use of the word “shall” marks a mandatory requirement. Use of the word “may” or “should” suggests optional elements. All conflicts within this document shall be resolved by the General Contractor in consultation with the Design Team. The standards of City of Reedsport shall take precedence in the resolution of any dispute.

D. Unauthorized changes and/or deviations from these specifications, regardless of scale, may result in re-design, reconstruction, or re-installation of communications elements at the contractor’s expense. Contractors shall obtain formal written approval prior to bidding and prior to installation in order to deviate from these specifications or from ANSI/TIA standards and BICSI methodologies. Contractors shall not deviate from NEC and NESC requirements.

E. Division 27 Specifications address information transport pathways, multiple different types of communication systems, spaces, media, grounding, identification, testing, and documentation requirements in support of multiple information transport infrastructures.

F. Specific responsibilities of Division 27 include, but are not limited to:
   1. Installation of the intra-building pathways, cabling, and coordinating space requirements necessary to house the communication systems and associated electronic information transport equipment. Pathways and spaces shall be provided to support the known systems and cabling requirements, as well as provisions for those that may be required in the future for growth purposes.
   2. The procurement and installation of each communications system and the associated components and cabling to create a fully functional system.
   3. Thorough testing shall be conducted of each individual communications system to illustrate compliance with specific performance requirements.
   4. Definition and establishment of administration and labeling schemes, conforming to Owner’s requirements.
   5. Securing all necessary permits and licenses, payment of all fees, and provision of all construction work notifications.
   6. Compliance with all applicable laws, ordinances, rules, and regulations.
   7. Mandatory project manager attendance at a weekly project status meeting with the General Contractor.
   8. It is the intent of the project drawings and specifications to provide complete and fully functional Division 27 communication systems, ready for use. Any item, not specifically shown in the project drawings or called for in the project specifications but normally required for a complete system, is to be considered a part of this contract.

G. System Continuity:
   1. Reconnect all existing items that remain in use. Provide all materials and labor required to retain continuity of existing circuits or systems that are disrupted by these alterations even though not indicated on the drawings.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 & 01 Specification Sections, apply to this Section.

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 27 0505 - SELECTIVE DEMOLITION OF COMMUNICATIONS SYSTEMS.
   2. Section 27 0526 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS.
   3. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS.
   4. Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.
   5. Section 27 0553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS.
   6. Section 27 1000 - STRUCTURED CABLING.
   7. Section 27 5129.13 - RESCUE ASSISTANCE SIGNALING SYSTEMS.

1.03 ABBREVIATIONS AND ACRONYMS

A. The following definitions are applicable to the work as indicated and as shown herein:
   1. ACR: Attenuation-to-Crosstalk Ration
   2. ADA: Americans with Disabilities Act
   3. AFF: Above Finished Floor
   4. ANSI: American National Standards Institute
   5. APC: Angle Physical Connector
   6. ASTM: American Society for Testing & Materials (ASTM International)
   7. AWG: American Wire Gauge
   8. BBC: Bonding Backbone Conductor
   9. BN: Bonding Network
   10. BICSI: Building Industry Consulting Service International, Inc.
   11. BTU: British Thermal Unit
   12. dB: Decibel
   13. dBmV: Decibel Millivolt
   14. EF: Entrance Facility
   15. EIA: Electronic Industries Association
   16. ELFEXT: Equal Level Far-End Crosstalk
   17. EMC: Electromagnetic Compatibility
   18. EMI: Electromagnetic Interference
   19. EMT: Electrical Metallic Tubing
   20. ER: Equipment Room
   21. ESD: Electrostatic Discharge
   22. FCC: Federal Communications Commission
   23. FD: Floor Distributor
   24. FEXT: Far-End Crosstalk
   25. F/FTP: Overall foil screened cable with foil screened twisted pair.
   26. F/UTP: Overall foil screened cable with unshielded twisted pair.
   27. FTP: Shielded twisted pair.
   28. FOTP: Fiber Optic Test Procedure
   29. Freq: Frequency
   30. GE: Grounding Equalizer (replacing TBBIBC)
   31. HC: Horizontal Cross-Connect
   32. HVAC: Heating, Ventilation, and Air Conditioning
   33. Hz: Hertz
   34. IC: Intermediate Cross-Connect
   35. IDC: Insulation Displacement Connector
   36. IDF: Intermediate Distribution Frame

37. IMC: Intermediate Metal Conduit
38. IEEE: Institute of Electrical and Electronics Engineers
39. ISO: International Organization for Standardization
40. LC: Lucent Connector
41. LCD: Liquid Crystal Display
42. MC: Main Cross-Connect
43. MDF: Main Distribution Frame
44. MHz: Megahertz
45. MM: Multimode
46. NEC: National Electrical Code, NFPA 70
47. NESC: National Electric Safety Code
48. NFPA: National Fire Protection Association
49. NRTL: Nationally Recognized Testing Laboratory
50. OSHA: Occupational Safety and Health Administration
51. OSP: Outside cable Plant
52. OTDR: Optical Time Domain Reflectometer
53. OLTS: Optical Loss Test Set
54. PBB: Primary Bonding Backbone
55. PR: Pair
56. RBB - Rack Bonding Busbar
57. RBC - Rack Bonding Conductor
58. RCDD: Registered Communications Distribution Designer
59. RFI: Radio Frequency Interference
60. RH: Relative Humidity
61. RMC: Rigid Metallic Conduit
62. RNC: Rigid Non-Metallic Conduit
63. S/FTP: Overall braid screened cable with foil screened twisted pair
64. S/UTP: Overall braid screened cable with unshielded twisted pair
65. SC: Subscriber Connector
66. SBB: Secondary Bonding Busbar
67. SE: Service Entrance
68. SM: Single Mode
69. TBB: Telecommunication Bonding Backbone
70. TBC: Telecommunications Bonding Conductor
71. TBBIBC: Telecommunications Bonding Backbone Interconnecting Bonding Conductor
72. TEBC: Telecommunications Equipment Bonding Conductor
73. TGB: Telecommunications Grounding Bus Bar
74. TIA: Telecommunications Industry Association
75. TMGB: Telecommunications Main Grounding Bus Bar
76. TO: Telecommunications Outlet
77. TR: Telecommunications Room
78. UL: Underwriters Laboratory
79. UBC: Unit Bonding Conductor
80. UPS: Uninterruptible Power Supply
81. WAO: Work Area Outlet
82. WAP: Wireless Access Point
83. UTP: Unshielded Twisted Pair

1.04 DEFINITIONS

A. The following definitions are applicable to the work as indicated and as shown herein:
   1. APC: Angle Physical Connector - An optical fiber connector that is polished at an angle of 8 to 10 degrees to reduce the back reflection of the signal.

2. Attenuation: The decrease in power of a signal, light beam, or light wave, either absolutely or as a fraction of a reference value. Attenuation is the opposite of gain and is measured in decibels (dB).
3. Backbone System: The cabling and connecting hardware that provides interconnection between Telecommunications Rooms, Equipment Room, and Entrance Facilities.
4. BCT: Bonding Conductor for Telecommunications - A conductor that interconnects the building's service equipment (power ground) to the telecommunications grounding system.
5. Coaxial Cable: A cable composed of an insulated central conducting wire wrapped in another cylindrical conducting wire and then wrapped in another insulating layer and an outer protecting layer.
6. Conduit Chase Pipe: Short section of bushed EMT conduit with sufficient size and capacity to support horizontal cabling bundles from ceiling space, through ceiling tile, onto the ladder tray system connecting wall to rack or cabinet.
7. Cross Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
8. Design Team: A group of individuals comprised of Architect(s) and Engineer(s) involved in assembling the contract documents known as the drawings and specifications.
9. EF: Entrance facility - A location within a building for both public and private network service cables. A facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a building and that complies with all relevant regulations. Also referred to as SE: Service Entrance.
10. ER: Equipment Room - A centralized space designed for telecommunications equipment that serves the occupants of a building. Equipment therein is considered distinct from an IDF (Telecommunications Room) because of its nature or complexity. Also frequently referred to as MCR or MDF.
11. F-Connector: (CATV) The final piece of hardware on a cable designed for CATV or DBS or other signal distribution applications. It is cylindrical with a center pin protruding out, that plugs into the set- top box, cable ready TV, satellite receiver, or VCR.
12. Fusion Splicing: An optical fiber splicing method that consists of two clean (stripped of coating) cleaved fibers then joining them and fusing the ends together with an electric arc.
13. GE: Grounding Equalizer - A conductor that interconnects elements of the telecommunications grounding infrastructure (formerly Telecommunications Bonding Backbone Interconnecting Bonding Conductor).
14. Horizontal System: The cabling between, and including, the TO (Telecommunications Outlet) connector and the HC (Horizontal Cross-connect) in the Telecommunications Room.
15. HC: Horizontal Cross-Connect - A group of connectors, such as patch panel or punch down block, that allows equipment and backbone cabling to be cross-connected with patch cords or jumpers. Floor Distributor (FD) is the international term for HC. Also frequently referred to as IDF.
16. Jack: Also commonly called an "outlet", it is the fixed, female connector.
17. J-Hook: A supporting device for horizontal cables that is shaped like a "J". It is attached to some building structures. Horizontal cables are laid in the opening formed by the "J" to provide support for cables.
18. Minor Pathway Support Hardware: Anchors, support brackets, clamps, clips, cable ties, D-rings, rack screws, velcro straps and etc. used to dress and secure cabling, conduits and surface raceways.
19. Multimode Optical Fiber: Optical fiber with a core diameter of 50 or 62.5 micron (micrometer) and a cladding diameter of 125 micron; light wave propagation allows many modes within multimode fiber. Also abbreviated as MM or FOMM.
20. OTDR: Optical Time Domain Reflectometer - An instrument that measures transmission characteristics by sending a series of short light pulses down an optical fiber element/strand and provides a graphic representation of the backscattered light.
21. OLTS: Optical Loss Test Set - A tool, consisting of a stabilized light source and optical power meter, that directly measures loss by computing the difference between the optical

power entering a fiber element/strand and the optical power exiting it.

22. Plug: Also commonly called a “connector”, it is the removable, male telecommunications connector.
23. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
24. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
25. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
26. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
27. SC: Subscriber Connector - An “full-size” optical fiber connector used for the termination of both multimode and single mode optical fiber cables (both simplex and duplex), having a square front profile with push-pull latching mechanism.
28. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
29. SE: Service Entrance - An entrance to a building for both public and private network service cables. A facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a building and that complies with all relevant regulations. Also referred to as EF: Entrance Facility.
30. Shield: A metallic layer, either a foil or braid, placed around a group of conductors.
31. Single Mode Optical Fiber: Optical fiber with a relatively small core diameter of 8-9 micron (micrometer) and a cladding diameter of 125 micron; light wave propagation is restricted to a single path, or mode, in single mode optical fiber. Also abbreviated as SM or FOSM.
32. Splice: A joining of conductors meant to be permanent. A device that joins conducting or transmitting media. Also referred to as straight splice.
33. Splice Case: A metal or plastic housing with a semi-cylindrical cavity used to clamp around a cable splice, providing a closure.
34. TE: Telecommunications Enclosure - A case or housing for telecommunications cable terminations and cross-connect cabling.
35. TO: Telecommunications Outlet - A device placed at the user workstation for termination of horizontal media and for connectivity of network equipment. Also referred to as WAO (Work Area Outlet).
36. Transition Splice: A planned splice point, at the building entrance, used to transition from non-rated outdoor to indoor-rated cable designs.
37. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.
38. WAO: Work Area Outlet - A device placed at the user workstation for termination of horizontal media and for connectivity of network equipment. Also referred to as TO (Telecommunications Outlet).

1.05 CODE REFERENCES AND STANDARDS

A. All work shall be in compliance with the following codes and agencies. Nothing contained within these specifications shall be misconstrued to permit work not in conformance with the most stringent of applicable codes and standards. It is assumed that bidders have access to, and specific knowledge of, the listed reference materials in order to ensure conformity with them.

1. National Electrical Code (NEC)
2. National Electrical Safety Code (NESC)
3. National Fire Protection Association (NFPA)
4. International Building Code (IBC)
5. Federal, State, and Local Codes.
6. National Electronic Manufacturer’s Association (NEMA)
7. Institute of Electronic and Electrical Engineers (IEEE)
8. American National Standards Institute/ Industries Association Telecommunication/ Electronic Industries Association (ANSI/TIA/EIA)
9. Occupational Safety & Health Administration (OSHA)

10. Federal Communications Commission (FCC)

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of the telephone and internet service provider pathway and entrance with the Electrical Contractor and the Owner's selected carrier.

B. Sequencing: Ensure that any wide area network, telephone service, and internet service connectivity cutover is achieved in a coordinated and orderly manner.

C. All Division 27 Contractor Project Managers shall schedule and conduct a coordination meeting with City of Reedsport Information Technology Department to confirm and coordinate scope of work requirements prior to commencement of work. Project meetings shall be scheduled through the General Contractor.

1.07 SUBMITTALS

A. Refer to Division 1 for exact submittal procedures.

B. The Division 27 Contractor shall provide for review, without exception prior to material acquisition and installation, the following items. Failure to submit required items shall disqualify the bidder.
   1. Product Data Sheets (Catalog Cuts)
   2. Backbone Diagram
   3. Riser Diagram
   4. Cabling Diagram
   5. System Schematics
   6. Signal Flow Diagram
   7. Dimensioned plans, sections and elevations and fabrication details.
   8. Specification Sheets for Test Equipment
   9. Bill of Materials
   10. Contracting Firm Qualifications and Certifications
   11. Installation Team Qualifications by Individual
   12. Current Manufacturer Certifications

C. Provide prior to completion:
   1. Cable data base listing patch panel station cable assignments. Database shall be provided on compact disc or other electronic media format when requested by the General Contractor, City of Reedsport or the Design Team. Database shall be submitted to the requesting party within seven (7) calendar days.
   2. Cable administration drawings, as requested to assist in the planning process. Drawings will be requested prior to final documentation.

D. Provide at completion of each construction phase area:
   1. Cable test and certification reports; summary hard copy or full test results on digital media when requested by the owner or design team. Reports shall be submitted to the requesting party within seven (7) calendar days.
   2. One (1) set of record drawings of the actual installation of the Division 27 systems. Drawings shall be given as full size originals and on digital media in AutoCAD format

E. Provide at final completion Closeout Submittals. This shall consist of three (3) bound sets of O&M (Operating and Maintenance) Manuals formatted as defined by Division 1 and one (1) electronic copy provided on digital media. Each copy of the O&M Manual shall include, at minimum, items listed as follows:
   1. Cable test and certification reports; summary hard copy and full test results on digital media. Test results shall be delivered at the completion of each project phase and at any time when called for by the Owner.
   2. Provide one (1) full-size hard copy set of record drawings (as-builts) to be submitted to the Design Team for approval, immediately upon completion of the installation.
   3. Instruction manuals including equipment and schedules, operating instructions, and manufacturer's instructions.

4. Manufacturer Warranty Certificate.
    a. Warranty contacts including but not limited to names, telephone numbers (office and mobile).
5. Networked Devices
    a. Provide the owner a list of all networked devices including all IP addresses and passwords for devices and managing software.

1.08 QUALITY ASSURANCE

A. Contracting firm shall constitute a company with a minimum of five (5) years successful installation experience with projects utilizing infrastructure and systems work similar to that required for this project.

B. Service Qualifications: Installing and servicing contractor shall have a permanent office within a 120-mile radius of the project site.

C. Cabling Contractor shall have at least one (1) Registered Communications Distribution Designer (RCDD) and installers with Installer-level BICSI Certifications on staff responsible for this project. Provide copies of these certificates in the submittal process.

D. Work crew, not involved in installing cable elements (e.g. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathway elements) do not require BICSI or manufacturer certification or registration.

E. Contractor shall provide a Manufacturer Certification for the system solution bid, issued directly in the bidder's company name, valid for the time frame in which the installation will be completed. Contractor shall be manufacturer certified in order to participate in the bid event.

F. The contractor shall be knowledgeable in local, state, regional, and national codes and regulations. All work shall comply with the latest revision of codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall apply.

G. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific solution being installed.

H. Only installers trained and certified by the proposed manufacturer shall be allowed to install firestop products.

I. Only installers trained and certified by the proposed manufacturer shall be allowed to terminate and test optical fiber. Others specified above may pull/ place optical fiber cable under the supervision of an installer trained and certified by the manufacturer.

J. Before bidding, the contractor shall study and compare all contract documents and promptly notify the Design Team of any discrepancies or deficiencies discovered by or made known to the contractor.

K. Discrepancies: Whenever a discrepancy or inconsistency exists between related information indicated on the contract drawings and/or specifications, this contractor shall obtain additional clarification and direction from the Design Team before proceeding. For bidding purposes, this contractor shall include the labor and materials necessary to comply with the solution that results in the greatest cost to the contract.
    1. If there is a conflict between applicable documents, then the more stringent requirement shall apply.
    2. The failure to question any controversial item will constitute acceptance by the bidder who shall execute it to the satisfaction of the owner after being awarded the contract.

L. Deficiencies: The contractor and associated subcontractors shall resolve all known deficiencies and omissions, including non-compliance with applicable codes, with the Design Team prior to ordering materials or proceeding with the work. Any work performed prior to receipt of instructions from the Design Team will be done so at the contractor's risk.
    1. If mention has been omitted pertaining to details, items or related accessories required for the completion of any system, it is understood such item and accessories are included in

the contract. After the contract is awarded, claims based on insufficient data or incorrectly assumed conditions, or claims based on misunderstanding the nature of the work, will not be recognized.

2. All devices, symbols and work illustrated shall be new work provided under this contract except work labeled existing to remain and equipment labeled to be furnished (or supplied) by others but installed by this contractor.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Equipment, materials, and supplies shall be shipped, handled and stored in ways that shall prevent damage to the items.

B. All items shall be handled and stored as recommended by the manufacturer.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under manufacturer's specified conditions, and free from damage or deterioration.

D. Equipment, materials, and supplies to be incorporated in the area of work shall be new unless otherwise specified.

E. Equipment, materials, and supplies shall be produced in a good workmanlike manner.

F. When the quality of a material, process, or article is not specifically set forth in the Drawings or Specifications, the best available quality of the material, process, or article shall be provided.

1.10 PROJECT CONDITIONS

A. Conditions and Measurements: Visit the jobsite to verify installation conditions and confirm measurements for all required systems and associated cabling connectivity.

1.11 WARRANTY

A. The Contractor shall submit, in the bid documents, any additional contractor-specific warranties or guarantees to be offered on the project.

B. The Contractor shall supply any and all necessary documentation needed to process and record the warranty(s) and to verify the installation solution.

C. Data Cabling System Warranty

1. All cabling systems shall include a minimum twenty-five (25) year application assurance warranty as a manufacturer registered system installation. During the warranty period, and for non-conformities of which contractor has notice, contractor shall take all necessary and appropriate action; free of charge, to correct any non-conformity with the warranties contained in the manufacturer agreement. During the warranty period, contractor shall provide to the Owner, free of costs and charges, all support necessary to ensure that the cabling system meets the requirements specified in this document and performance guarantees provided by the contractors. During the warranty period, contractors shall furnish, or cause to be furnished, all maintenance, service, parts and replacements necessary to maintain the cabling system in good working condition, at no cost to the Owner.

2. The contractor shall supply a full manufacturer’s application assurance warranty for all new installations, to include approved termination hardware and cabling media from the proposed manufacturer’s list of approved materials. Services to be provided by this contractor to the Owner during the warranty period shall include, without limitation, the following:

a. Remedial Maintenance

1) Contractor shall provide service on the Owner's site as necessary including, but not limited to, fault isolation, diagnosis, and repair.

b. Maintenance Records

1) Contractor shall maintain, at the jobsite, a current record of the cabling system configuration.

c. Replacement Parts

1) Contractor shall provide and install replacement parts, including new components.

D. All Other Communications Systems Warranty
   1. Unless listed elsewhere within these specifications, a warranty shall be provided for a minimum of one (1) year for all other communications systems listed. One year shall begin from the date of Substantial Completion. This warranty shall cover both product and service to address remedial maintenance and replacement parts as is appropriate to keep each system complete and fully functional.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. If a Bidder proposes to Substitute an article, device, material, equipment, form of construction, fixture, or item other than the approved manufacturers and part numbers, listed and named in the Specifications, the Bidder shall certify that the proposed item is equal in quality and all aspects of performance and appearance, to the items specified. The Bidder shall submit a request for Substitution to the Design Team by following the instruction in Specification Section 01 6000, which must include:
   1. The name and complete description of the proposed Substitution including Drawings, performance and test data, and other information necessary for a complete evaluation; and
   2. A statement setting forth any changes that the Proposed Substitution will require in the Contract Documents or the project.

B. If the Design Team approves the Proposed Substitution, the Design Team shall issue an Addendum. If the Design Team does not approve the substitution, the Design Team shall inform the Bidder of its decision, which is final. The Design Team may reject a proposed Substitution because the Bidder failed to provide sufficient information to enable the Design Team to completely evaluate the Proposed Substitution without causing a delay in the scheduled bid opening.
   1. Proposed Substitutions received by the Design Team after the allotted time allowed by Section 01 6000 shall not be considered.

C. Bidder shall confirm all reference part numbers, listed within Division 27, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.
   1. All materials associated with reference parts shall be included so as to constitute a complete and functional system, whether or not specifically identified and itemized.

2.02 ASSEMBLIES

A. Sleeves and Pathways for Cabling:
   1. Where additional conduits are needed beyond those shown on the drawings to accommodate the installation of systems cabling, this contractor (Division 27) shall include such provisions in this contract. Provide conduit suitable for its application and sized in accordance with industry standards. Include nylon bushings at conduit ends and firestopping as required around conduits wherever building barriers are penetrated. If necessary, this contractor shall hire a qualified contractor to perform this work.

PART 3 - EXECUTION

3.01 CLEANING

A. Division 27 Contractor shall thoroughly clean all assemblies within the telecommunications room's space before they are turned over to the City of Reedsport IT Services for operation. Cleaning shall include, but not be limited to, all ladder tray, racks and wire managers (both inside and out), copper and optical fiber panels (both inside and out). Should any telecommunications room or closet be completed prior to the balance of the floor space construction that it serves, racks, cabinets, and wall frames shall be covered with plastic sheeting to repel dust and other contaminants to which they will be subjected.

B. At the end of each workday or shift, the Contractor shall be required to clean-up the work area and remove all construction debris such that the site is clean and usable without hazard to workers.

3.02 PROJECT CONDITIONS

A. The Owner shall not be responsible for delays in work because of shutdowns due to unsafe working practices by Contractors.

B. The active information transport system and cabling associated with specific work beyond the construction area shall not be disrupted at any time.

C. Contractor shall clean work areas each day and remove debris properly and legally from the project site. Materials and supplies stored for use in the project shall be neatly stacked outside the circulation areas. All exits and paths shall be cleaned so as to prevent dirt from being tracked into the site.

D. It shall be the responsibility of the Contractor to secure any parking permits prior to the first day of work on-site.

E. Work outside of normal operating hours and days shall be coordinated with City of Reedsport.

3.03 SAFETY REQUIREMENTS

A. All contract work shall be performed in accordance with the policies, procedures, and standards established by the Owner.

B. In construction areas, all Contractor personnel shall wear personnel protection devices, as deemed appropriate by the General Contractor and as required by OSHA for the work location and work operation being performed. Devices shall include, but not be limited to hardhats, work boots, safety eye protection, reflective vests, etc.

C. All exposed holes, pits, pipes, etc., either inside or outside the project site, shall be barricaded or plated and adequately secured when Contractor personnel are not present. All ladders, hanging wires, pipes, and other items protruding at a pedestrian level travel way most be removed or secured following the final shift of the day.

D. During breaks or when only a portion of work has been completed, tools shall not be left exposed where others may risk injury or attempt to use them. Windows and doors shall not be left unsecured or propped open during breaks. At the completion of the final shift each day, doors, windows, or other openings shall be adequately secured.

E. When driving on the Owner's property, Contractor personnel shall observe all traffic safety regulations and pay particular attention to pedestrians. All loose material and debris on vehicles shall be adequately secured and tied down.

END OF SECTION 27 0000

SECTION 27 0505
SELECTIVE DEMOLITION OF COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Demolition and removal of selected portions of building or structure.

B. Demolition, temporary removal, relocation, or reconfiguration of selected site elements and/or Information Technology (IT), Security or other Special Systems or infrastructure.

C. Salvage of existing items to be reused or recycled.

D. Contractor shall include in the Bid all labor, materials, tools, transportation, storage costs, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete demolition and cutover of existing telecommunication systems shown and described in the drawings and specifications herein.

E. The Contractor is responsible for providing and coordinating phased activities and construction methods that minimize disruption to operations and provide complete and operational systems. Equipment and devices shall not be removed or reconfigured until removal or reconfiguration has been coordinated with owner and approval is given in writing.

F. The Contractor shall coordinate interfaces to existing systems that are being demolished in order to minimize disruption to the existing systems operations. Any systems outages shall be approved in advance and scheduled with City of Reedsport.

1.02 RELATED REQUIREMENTS

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

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.03 ABBREVIATIONS AND ACRONYMS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.04 DEFINITIONS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.05 CODE REFERENCES AND STANDARDS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.06 ADMINISTRATIVE REQUIREMENTS

A. Pre-Demolition Meeting
   1. Conduct a pre-demolition meeting at Project Site with General Contractor and City of Reedsport and all affected stakeholders.
      a. Inspect and discuss condition of construction to be selectively demolished.
      b. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Existing telecommunications rooms that have demolition work may involve electrical, mechanical and architectural demolition. Review and coordinate requirements of work performed by other trades.
      d. Review areas where existing construction is to remain and requires protection.
      e. Review procedures to be followed when critical systems are inadvertently interrupted. The Contractor shall be responsible for the coordination required with City of Reedsport prior to device removal to ensure systems that must remain operational

are not compromised during the demolition process.

1.07 QUALITY ASSURANCE

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.08 PROJECT CONDITIONS

A. The owner WILL occupy portions of building during selective demolition.

B. Conduct selective demolition so Owner's operations will not be disrupted.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Field verify the existing conditions, device equipment locations to determine the extent of the demolition required. Notify the Design Team of discrepancies between existing conditions and Drawings before proceeding with selective demolition. Proceeding with demolition indicates and acceptance of existing conditions by the contractor.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify the Design Team. Hazardous materials will be removed by Owner under a separate contract.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Demolition and construction methods shall conform to City of Reedsport requirements and all applicable building codes.

B. Verify that utilities have been disconnected and capped per approved procedures before starting selective demolition operations.

C. Survey existing condition of all communications systems related conduits and cables from origin to destination and correlate with requirements indicated to determine extent of selective demolition required.

D. Label all conduits and cables with origin, destination and what system they serve.

E. Consult with the Owner to determine whether systems can be disabled or whether a new parallel system needs to be installed.

F. When unanticipated mechanical, electrical, or structural 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 the Design Team.

3.02 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. Comply with requirements for access and protection.

C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

D. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

E. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

F. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

G. Cover and protect furniture, furnishings, and equipment that have not been removed.

H. Comply with requirements for temporary enclosures, dust control, heating, and cooling.

3.03 SELECTIVE DEMOLITION

A. 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. Complete selective demolition operations above each floor or tier, before disturbing supporting members on the next lower level, if applicable. Remove all abandoned cable from origin to destination.
   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. 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 spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and/or portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's designated storage area. Coordinate delivery of equipment with the Owner seven (7) days prior to delivery.
   5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
   5. Perform testing on reinstalled active systems and get sign-off by the Owner or Owner’s representative inspector that systems are re-connected and working properly.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their

original locations after selective demolition operations are complete.

3.04 UTILITY SERVICES AND COMMUNICATION SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions.
   2. For existing equipment with active components in them, provide dust protection and circulate cooling air with a portable air conditioning unit or other means to ensure equipment does not overheat.

B. Existing Services/Systems to Be Removed, or Relocated: Locate, identify, disconnect, and seal or cap off indicated utility services and communications systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor. Coordinate the disconnection of all electrical circuits with the Electrical Contractor prior to disconnection.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.05 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 onsite.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

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

3.06 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.

B. The contractor shall be required, on a daily basis, to dispose of any demolished material not required to be returned to the Owner. All materials shall be transported off of the Owner’s property at the expense of the Contractor.

C. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

END OF SECTION 27 0505

SECTION 27 0526
GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Conductors
   2. Connectors
   3. Grounding Busbars
   4. Clamps
   5. Miscellaneous
   6. Labeling

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   1. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   2. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.
   3. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS.
   4. Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.
   5. Section 27 1000 - STRUCTURED CABLING.

1.03 ABBREVIATIONS AND ACRONYMS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.04 SUBMITTALS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.05 CLOSEOUT DOCUMENTS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.06 QUALITY ASSURANCE

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

PART 2 - PRODUCTS

2.01 GENERAL

A. Comply with TIA 607 – latest revision.

B. Conductors shall comply with UL 486A–486B.

2.02 CONDUCTORS

A. The Telecommunications Bonding Conductor (TBC) shall be a UL listed, stranded conductor insulated with a green jacket. The TBC shall be equal in size to the TBB specified elsewhere in this Section.

B. The Telecommunications Bonding Backbone (TBB) Grounding Conductors shall be:
   1. Shall be bare or insulated copper, of minimum conductor size #6 AWG and sized at 2 kcmil per linear foot up to a maximum size of 750 kcmil. (For details on TBB sizing see "Execution" section at end of this document).
   2. Where un–insulated, to be identified with green tape at termination location.
   3. Labeled in accordance with recommendations set forth in ANSI/TIA–606 Administration Standard for Telecommunications Infrastructure.

4. Approved Manufacturer:
    a. General Cable
    b. Southwire
    c. Burndy

C. The Equipment Bonding Conductors (EBCs)
1. Shall be #12 AWG or larger stranded conductor with a green insulating jacket
2. Approved Manufacturer:
    a. Panduit
3. Approved Equipment Bonding Conductors (EBCs):
    a. RGEJ Series

D. Bonding Conductor (BC): BC shall be #6 insulated (green) stranded copper conductor.

E. Rack Bonding Conductor Kits (RBC):
1. Bonds the rack or cabinet to the room's grounding busbar (PBB or SBB).
2. Jumper kits available with both ends factory terminated to provide a bolt–on solution.
3. Jumper kits available with one end factory terminated to attach to the rack or cabinet; free end accommodates unique length requirements.
4. Engineered to comply with US and international grounding requirements.
5. Approved Manufacturer:
    a. Panduit
6. Approved rack jumper (RBC) kits:
    a. GJ672UH – Terminated on both ends for smaller telecommunications rooms where racks have individual connections directly to the SBB. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre–terminated on one end with LCC6–14JAWH–L and the other end with LCC6–14JAW–L. Comes in lengths 72", 96", 120", 144", 168", 192:", 216", 240", 264", and 288". For other lengths substitute "72" in part number with desired length
    b. GJS6120U – Terminated on one end for larger telecommunications rooms where racks are individually bonded to underfloor or overhead bonding backbone with an HTAP connection. One 120" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre–terminated on one end with LCC6–14JAW–L. For 180" length substitute "120" in part number with "180"
    c. HDW3/8–KT – Stainless steel mounting hardware for busbar; two 3/8–16 hex bolts, two 3/8–16 hex nuts, four 3/8 flat washers and two 3/8 Belleville compression washers. Mounting hardware for rack or cabinet; two #12–24 thread–forming screws and two M6 thread–forming screws
    d. HDW1/4–A–KT – Stainless steel mounting hardware for busbar; two 1/4–20 hex bolts, two 1/4–20 hex nuts, four 1/4 flat washers and two 1/4 Belleville compression washers. Mounting hardware for rack or cabinet; two #10–32 thread–forming screws and two M5 thread–forming screws

F. Equipment Jumper Kits (Unit Bonding Conductor or "UBC"):
1. Used to ground large, chassis–style rack mounted equipment that have built–in grounding pads or terminals.
2. Bond network equipment to grounding strip or grounding busbar.
3. Jumper kit available with both ends factory terminated to provide a bolt–on solution.
4. Jumper kit available with one end factory terminated to attach to the grounding strip or grounding busbar; free end accommodates unique equipment terminations.
5. Use jumpers with 90° bent lug, on grounding strip side, for high density grounding requirements up to one ground point per RU.
6. Use jumpers with 45° bent lugs on grounding strip side, for improved cable management.
7. Engineered to comply with US and International grounding requirements.
8. Approved Manufacturer:
    a. Panduit
9. Approved equipment jumper (UBC) kits:

a. GJS6 series – #6 equipment jumper factory terminated on one end for switches, cabinets and 4 post racks. Exact part number depends on length
b. RGE series – Factory terminated jumpers that are terminated on both ends. Exact part number depends on AWG size, length and angle of two–hole lugs

G. Surge Suppressor Jumper Kit:
1. Bonds power or data line surge suppressor to grounding strip or grounding busbar.
2. Both ends factory terminated to provide a bolt–on solution.
3. Engineered to comply with US and International grounding requirements.
4. Approved Manufacturer:
   a. Panduit
5. Approved surge suppressor jumper kits:
   a. SSGK–1 – #10 AWG (6mm²) jumper; 24" (.61m) length; factory terminated on both ends; one–hole lug on surge suppressor to two–hole lug on grounding strip/busbar side; provided with .16 oz. (5cc) of antioxidant and two each #12–24 x 1/2", M6 x 12mm, #10–32 x 1/2" and M5 x 12mm thread–forming screws

H. Armored Cable Grounding Kit:
1. Provides a secure bond to the armor sheath on indoor and indoor/outdoor fiber optic cables at both cassette and enclosure ends.
2. Worm–gear design evenly distributes forces across the armor.
3. Made from steel and aluminum material is compatible with common armor for long term reliability.
4. Black insulating cover protects and hides the connection for an aesthetically pleasing work area.
5. Complies with industry requirements ensuring a high level of reliability and safety.
6. Approved Manufacturer:
   a. Panduit
7. Approved armored cable grounding kits:
   a. ACG24K – #6 AWG (16mm2) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two–hole copper compression lug and the other end with grounding terminal; provided with two each #12–24 and M6 thread–forming screws and a black polypropylene terminal cover
   b. ACG24K–500 – #6 AWG (16mm2) jumper for armored cable diameter 0.85" (21.6 mm) to 1.03" (26.2mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two–hole copper compression lug and the other end with grounding terminal; provided with two each #12–24 and M6 thread–forming screws and a black polypropylene terminal cover
   c. ACGK – Armored cable grounding kit. Contains one grounding terminal for #6 AWG grounding conductor, and one #10 mechanical clamp for cable diameters in 9/16" – 1 1/16" diameter range

2.03 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A–486B

B. Compression Wire Connectors: Crimp–and–compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

C. Code/Flex Conductor H–TAPs
1. Used as a splice, or to tap smaller (pigtail) conductors into larger continuous conductors.
2. Each HTAP terminates a wide range of conductor sizes and combinations of code and flex conductors Class G, H, I and Locomotive to suit a variety of applications.
3. Slotted design allows quick and easy assembly of conductor to HTAP using
4. Three 94V–0 cable ties (supplied).

5. Tap grooves are separated from one another, allowing them to function independently so HTAP can be used with single or multiple conductors, providing maximum design and installation flexibility.
6. Color coded and marked with die index numbers for proper crimp die selection.
7. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600 V when crimped with Panduit tools and dies, or with other specified manufacturers' crimping tool and dies.
8. Tin plated to inhibit corrosion.
9. Available with an assortment of clear covers with integrated label fields.
10. Approved Manufacturers for HTAPs and clear covers:
    a. Panduit
11. Approved parts for HTAPs:
    a. HTCT series – Panduit HTAPs. Must be selected according AWG size of run and tap conductors.
    b. CLRCVR series – Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.

D. Code Conductor, Thin Wall, Tin–plated C–TAP (splice)
1. For copper–to–copper splicing or pigtail tap splicing.
2. Wide wire range–taking capability minimizes inventory requirements.
3. Color–coded for proper crimp die selection.
4. Ribbed design provides high strength.
5. Made from high conductivity wrought copper.
6. Tin–plated to inhibit corrosion and oxidation.
7. UL Listed and CSA Certified with AWG conductor to 600 V and temperature rated to 90°C when crimped with Panduit and specified manufacturers' crimping tools and dies.
8. Approved Manufacturer for C–TAPs:
    a. Panduit
9. Approved parts for C–TAPs:
    a. CTAPF series – Panduit C–TAPs. Must be selected according AWG size of conductors being spliced.

E. Two–hole, Long–barrel Compression Lugs for Grounding Conductors
1. Meets TIA–607 requirements for network systems grounding applications.
2. Tested by Telcordia – meets NEBS Level 3 with AWG conductor.
3. UL Listed and CSA Certified with AWG conductor for use up to 35 KV** and temperature rated 90°C when crimped with Panduit and specified manufacturers' crimping tools and dies.
4. Color–coded barrels marked with Panduit and specified manufacturers' die index numbers for proper crimp die selection.
5. Have long barrel to maximize number of crimps and provides premium wire pull–out strength and electrical performance.
6. Have "inspection window" over tongue to visually assure full conductor insertion.
7. Be tin–plated to inhibit corrosion
8. Available with NEMA and BICSI hole–sizes and spacing
9. Approved Manufacturers for lugs:
    a. Panduit
10. Approved parts for two–hole compression lugs:
    a. LCC series – Panduit two–hole compressing lugs for code conductors in BICSI hole spacing.

2.04 GROUNDING BUSBARS

A. The Primary Bonding Busbar (PBB) shall be:
1. A solid, tinned copper bar, 4 inches wide by 20 inches long by 1/4 inch thick.
2. Meet BICSI and TIA–607 requirements for network systems grounding applications.

3. Employ BICSI hole spacing to fit LCC series 2–hole lugs.
4. Be made of high conductivity copper and tin–plated to inhibit corrosion.
5. Come pre–assembled with brackets and insulators attached for quick installation.
6. Use component labels to identify busbars to meet TIA–606.
7. Approved Manufacturer:
   a. Panduit
8. Approved Primary Bonding Busbar (PBB):
   a. GB4B0624TPI–1 – Grounding Busbar, BICSI 1/4" x 4" x 20" – 24 number of mounting positions with 1/4" stud hole with 5/8" hole spacing, and 6 number of positions with 3/8" stud hole with 1" hole spacing.

B. The Secondary Bonding Busbar (SBB) shall be:
1. A solid, tinned copper bar, 2 inches wide by 10 inches long by 1/4 inch thick.
2. Meet BICSI and TIA–607 requirements for network systems grounding applications.
3. Employ BICSI hole spacing to fit LCC series 2–hole lugs.
4. Be made of high conductivity copper and tin–plated to inhibit corrosion.
5. Come pre–assembled with brackets and insulators attached for quick installation.
6. Use Panduit component labels, sold separately, to identify busbars to meet TIA–606.
7. Approved Manufacturer:
   a. Panduit
8. Approved Secondary Bonding Busbar (SBB):
   a. GB2B0306TPI–1 – Grounding Busbar, BICSI 1/4" x 2" x 12" – 3 number of mounting positions with 3/8" stud hole with 1" hole spacing, 6 number of mounting positions with 5/16” stud hole with 5/8” spacing and 3 number of mounting positions with 7/16” hole with 1” spacing.
   b. GB4B0612TPI–1 – Grounding Busbar, BICSI 1/4" x 4" x 12" – 6 number of mounting positions with 3/8" stud hole with 1" hole spacing, 12 number of mounting positions with 5/16” stud hole with 5/8” spacing and 6 number of mounting positions with 7/16” hole with 1” spacing.
   c. GB2B0304TPI–1 – Grounding Busbar, BICSI 1/4" x 2" x 10" – 3 number of mounting positions with 3/8" stud hole with 1" hole spacing, 4 number of mounting positions with 5/16” stud hole with 5/8” spacing and 3 number of mounting positions with 7/16” hole with 1” spacing.

C. Grounding Busbar for Racks and Enclosures
1. With each enclosure and rack, provide a tinned copper busbar to serve as an extension of the PBB or SBB for the equipment in the cabinet.
2. Shall be manufactured from copper alloy.
3. Horizontal Busbars shall be at least .75 inches (19 mm) wide, 19 inches (483 mm) long, and 0.1875 inches (5 mm) thick.
4. Have at least 14, factory–provided #12–24 threaded holes.
5. Have pre–punched EIA 310 D mountings, which match that of the vertical rail, for attachment to the mounting rail.
6. Vertical Busbars shall be at least 0.67 inches (17 mm) wide, 78.65 inches (2 m) long, and 0.05 inches (1.27 mm) thick and come in threaded rail and cage nut versions.
7. Include a hardware kit with rack installation hardware and with screws for bonding equipment to the busbar.
8. Approved Manufacturer:
   a. Panduit
9. Approved rack and cabinet mount horizontal busbars:
   a. RGRB19Y – Rack Grounding Busbar Kits, 19" (483mm) Length, 14 mounting holes, 1/2" (12.7mm) Hole Spacing.
   b. RGRB19U – Rack Grounding Busbar Kits, 19" (483mm) Length, 20 mounting holes, 5/8" (15.9mm) Hole Spacing.

c. RGRKCBNJY – Rack grounding kit to ground the rack; includes one RGRB19U busbar, one HTCT250–2–1 HTAP, and one RGREJ696Y grounding jumper.
d. RGRKCBNJEJY – Rack grounding kit to ground the rack and one piece of equipment; includes one RGRB19U busbar, one HTCT250–2–1 HTAP, and two RGREJ696Y grounding jumpers.
e. CGR630U – Complete Grounding Kit for new installations on cabinets with, threaded #12–24 or M6 rail fasteners and rail depth up to 30" (0.75m).
f. CGR630UB – Complete Grounding Kit for new installations on cabinets with cage nut rail fasteners and rail depth up to 30" (0.75m).

10. Approved rack and cabinet mount vertical busbars:
    a. RGS134–1Y – Grounding strip for threaded rails; 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12–24 x 1/2" and M6 x 12mm thread–forming screws.
    b. RGS134B–1 – Grounding strip for use with cage nut rail fasteners; 78.70" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker, three cage nut bonding studs, eight #12–24 bonding nuts and three strip clips.

2.05 CLAMPS

A. Pipe Clamps:
1. Used to ground copper code conductor to water pipe or copper tubing.
2. Cast from high strength, electrolytic bronze to provide reliable grounding connections.
3. Plated steel screws provide high strength and inhibit corrosion.
4. Accommodates a wide range of pipe, tube, rod and conductor sizes – minimizes inventory.
5. cULus 467 Listed for grounding and bonding with AWG conductor.
6. Approved manufacturer:
    a. Panduit
7. Approved bronze grounding pipe clamps:
    a. GPC2–1–Q – pipe range ½” – 1" and conductor size range #10 SOL – #2 STR.
    b. GPC2–2–L – pipe range 1 ¼” – 2” and conductor size range #10 SOL – #2 STR.
    c. GPC2–4–X – pipe range 2 ½” – 4” and conductor size range #10 SOL – #2 STR.

B. Bronze Grounding Clamps for Conduit:
1. Used to ground copper conductor parallel to, or at a right angle to a rod, tube, or pipe.
2. Made from high strength, electrolytic cast bronze.
3. High strength silicon bronze hardware provides long term reliable assembly.
4. Accommodates a wide range of pipe, tube, rod and conductor sizes – minimizes inventory.
5. cULus 467 Listed for grounding and bonding with AWG conductor and suitable for direct burial in earth or concrete.
6. Approved manufacturer:
    a. Panduit
7. Approved bronze grounding conduit clamps:
    a. GPL–8–Q – pipe size inches ½” or ¾” and conductor size range AWG #8 SOL – #4 STRL.
    b. GPL–14–X – pipe size inches 1” and conductor size range AWG #8 SOL – #4 STR.
    c. GPL–22–X – pipe size inches 1 ¼” and conductor size range AWG 2/0 SOL – 250 kcmil.
    d. GPL–28–X – pipe size inches 1 ½” and conductor size range AWG 2/0 SOL – 250 kcmil.
    e. GPL–34–3 – pipe size inches 2” and conductor size range AWG 2/0 SOL – 250 kcmil.

C. Copper and Aluminum One–Hole Grounding Lay–in Lug for bonding ladder rack

1. Used for quick installation of a continuous grounding conductor.
2. cULus 467 Listed for grounding and bonding, copper lugs. UL Listed for direct burial in earth or concrete.
3. cULus Listed for use up to 600 V and temperature rated 90°C
4. Approved manufacturer:
   a. Panduit
5. Approved one–hole grounding lay–in lug:
   a. LICC4–22–C – Copper body, 0.22 inch stud hole, conductor size range AWG #14 SOL – #4 STR.
   b. LICC4–22TP–C – Tin plated copper body, 0.22 inch stud hole, conductor size range AWG #14 SOL – #4 STR.
   c. LIAC4–22–C – Tin plated aluminum body, 0.22 inch stud hole, conductor size range AWG #14 SOL – #4 STR.
   d. LIAS1/0–14–L – Tin plated aluminum body, 0.27 inch stud hole, conductor size range AWG #14 SOL – #1/0 STR.
   e. LIAS250–56–Q – Tin plated aluminum body, 0.33 inch stud hole, conductor size range AWG #6 SOL – 250 kcmil STR.

D. Universal Beam Grounding Clamp
1. Used to for bonding structural steel (ex: I–beams) into bonding network.
2. Universal, fits on a wide range of standard (angled) and wide flange (parallel) structural steel beams.
3. Provide a mounting pad suitable for a two–hole compression lug.
4. Installs quickly and easily with standard 1/4" key hex wrench tooling.
5. UL 467 Listed and CSA 22.2 Certified for grounding and bonding suitable for direct burial in earth or concrete.
6. Comply with vibration tests per MIL–STD–202G (METHOD 201A).
7. Approved Manufacturer for beam grounding clamps:
   a. Panduit
8. Approved parts for beam grounding clamps:
   a. GUBC500–6 – Universal Beam Grounding Clamp for copper conductor sizes ranging from #6 AWG to 500 kcmil and flange thickness from .25" to .675". Stud size is 1/2" with hole spacing for two–hole lug being 1.75" and thread size from 1/2 to 13.

2.06 MISCELLANEOUS

A. Miscellaneous Bonding Accessories
1. Anti–oxidation Paste (contact aid) For Copper to Copper and Copper to Steel Connections.
2. Anti–oxidation Paste (contact aid) For Aluminum Pad–to–Pad or Thread–to–Thread Aluminum Connections.
3. Green thread–forming bonding screws for bonding smaller equipment on threaded rack rails through the equipment mounting flange.
4. Green bonding cage nuts from bonding smaller equipment on cage nut rails through the equipment mounting flange.
5. Thread forming screws for bonding two–hole lugs to vertical busbars on threaded rack rails.
6. Green paint piercing grounding washers for assuring electrical continuity between painted parts of equipment racks, as described in TIA 607 Standard.
7. Bonding hardware kits (studs) for forming low–resistance bond between the rack or cabinet and painted rack mounted appliances and equipment.
8. Approved Manufacturer:
   a. Panduit
9. Approved miscellaneous bonding/grounding components and accessories:
   a. CMP–300–1 – Contact aid (anti–oxidant paste) for copper–to–copper and copper–to–steel connections in 8 oz. container. Operating temperature range –40°F

(–40°C) to 350°F (177°C). Good for all voltages and suitable for grounding. Also, may be used for anti–seizing thread lubricant.

b. CMP–100–1 – Contact aid (anti–oxidant paste) for pad–to–pad or thread–to–thread aluminum connections made on aluminum conductor in 8 oz container. Operating temperature range –40°F (–40°C) to 400°F (204°C).

c. RGTBSG–C – Green thread–forming bonding screw, #12–24 x 1/2" for mounting smaller equipment and bonding to rack/cabinet racks through equipment mounting flange.

d. RGTBS1032G–C – Green thread–forming bonding screw, #10–32 x 1/2" for mounting smaller equipment and bonding to rack/cabinet racks through equipment mounting flange.

e. CNB4K – Green bonding cage nut, includes 4 #12–24 bonding cage nuts (.06 – .11 thick panel) and 4 #12–24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket). Ideal for patch panel applications.

f. CNBK – Green bonding cage nut, includes 50 #12–24 bonding cage nuts (.06 – .11 thick panel) and 50 #12–24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket).

g. RGW–100–1Y – 100 paint piercing bonding washers for 3/8" (M8) stud size; .875" (22.2mm) O.D.; provided with .16 oz. (5cc) of antioxidant.

h. TRBSK – Bonding stud kit for threaded #12–24 rail fasteners; includes 25 bonding studs and 50 bonding nuts for bonding painted equipment and appliances to rack/cabinet rails and vertical busbars.

i. CGNBSK – Bonding stud kit for cage nut rail fasteners; includes 25 bonding studs and 50 bonding nuts for bonding painted equipment and appliances to rack/cabinet rails and vertical busbars.

j. CJSGK–XY – Kit used to ground enhanced Giga–TX™ Style Shielded Jack Modules to another ground wire in shielded applications.

2.07 LABELING

A. Comply with TIA–606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV–resistant seal for label.

C. Approved Manufacturer:
   1. Panduit

D. Approved labeling components, listed for each printer type – Laser/Inkjet, LS8Q or Desktop Thermal:
   1. S100X075YAJ/S100X075VAC/S100X075VAT – 18–14 AWG conductor labels.
   2. S100X125YAJ/ S100X125VAC/S100X125VAT – 12–10 AWG conductor labels.
   3. S100X225YAJ/ S100X225VAC/S100X225VAT – 8–4 AWG conductor labels.
   4. S100X400YAJ/ S100X400VAC/S100X400VAT – 2–1 AWG conductor labels.
   5. S100X650YAJ/ S100X650VAC/S100X650VAT – 1/0–250 MCM conductor labels.
   6. C400X200YJJ/C200X100YPC/C400X200YPT – PBB and SBB labels.
   7. Refer to Section 27 05 53 IDENTIFICATION FOR COMMUNICATION SYSTEMS for more detail.

PART 3 EXECUTION

3.01 GENERAL

A. Examination
   1. Examine the AC grounding electrode system and equipment grounding for compliance with requirements for maximum ground–resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

2. Inspect the test results of the AC grounding system measured at the point of TBC connection.
3. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
4. Proceed with connection of the TBC only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. This Specification document describes a generic enterprise communications bonding and grounding system for the construction of a complete and functioning grounding system without prior knowledge of the particular facilities where it will be used. It is the responsibility of the installing contractor to adapt these general guidelines and principles to the requirements of the actual environments where the systems are to be implemented.

B. System shall provide equipment ground connections (bonds) from the premises entrance facility and outside–plant earthing system to each telecommunication room telecommunication ground busbar, through the racking systems to bond the network equipment.

C. Entire grounding link from equipment to earth should be visually verifiable except where hidden by walls, conduit or pathways.

D. Installing contractor shall label all elements of the communications bonding network according to guidelines defined in TIA–607–D and ANSI/TIA 606–B.

E. It is the responsibility of the installer to be knowledgeable of all previously cited Standards and Codes and to bring to the attention of KCL Engineering any conflicts or discrepancies to achieve a fully functioning, standards–compliant earthing system.

F. Contractors working around or adding to existing legacy systems shall bring to the attention of KCL Engineering previously installed network elements that may not comply with modern grounding requirements for possible remediation.

G. Telecommunications Bonding Backbone (TBB):
   1. Bonding and grounding conductors may be insulated or un–insulated and shall not decrease in size as the grounding path moves closer to earth.
   2. Connections (bonds) between the telecommunications grounding network and associated electrical panels shall be done by a qualified electrician in accordance with guidelines in TIA 607 and applicable electrical codes.
   3. Bonding Conductors should be continuous and routed in the shortest possible straight–line path, avoiding changes in elevation and sharp bends.
   4. TBB conductors shall be protected from mechanical damage and built to minimize splicing. Where splicing is unavoidable, they shall be done using irreversible compression splices (C–TAPS) built to that purpose. See the "Materials" section of this document for appropriate compression splices.
   5. TBB in multi–story buildings with multiple risers (multiple TBBs) shall employ a grounding equalizer (GE) between vertical grounding backbones at the top floor of the building and minimally at every third floor in between to the lowest floor level. The GE shall be no smaller than the largest sized TBB.
   6. Routing grounding conductors through ferrous metal conduit should be avoided, but if it is necessary due to building constraints, any grounding conductor running through ferrous conduit longer than 3 feet shall be bonded at the end using appropriately sized HTAP and Conduit grounding clamps as described TIA 607 using appliances described for that purpose in the "Materials" section of this document.
   7. Conductors used to bond TBB to conduit ends shall be of #6 AWG size or larger.
   8. Conductor sizing shall be based upon project specification (drawings and notes) for that installation. These sizes are based on TBB length per TIA 607 recommendations.

H. Entrance Facilities and Primary Bonding Busbar (PBB):
   1. PBB shall be located in the entrance facility, near the electrical panel to which it will be bonded but installed to maintain clearances required by applicable electrical codes.

2. PBB shall be sized according to the anticipated number of bonded connections needed.
3. PBB shall have tinned surface to restrain oxidation and be cleaned and antioxidant paste applied prior to fastening conductors.
4. Connectors on TBB which attach to PBB shall be of two–hole, long–barrel compression lugs of the LCC series as specified in the "Materials" section of this document.
5. Building steel within six feet of the communications grounding system should be bonded into the system with appropriate hardware listed in "Materials" section of this document.
6. All cables containing a metallic shield or armor shall have that shield properly bonded into the communications grounding system using the appropriately sized Armored Cable Grounding Kit listed in the "Materials" section of this document.

I. Telecommunications Rooms and Secondary Bonding Busbar (SBB):
1. Each telecommunications room shall have its own SBB to which equipment and dead steel (building steel and support structures) in that room are bonded.
2. The SBBs shall have a tinned surface to inhibit oxidation and be sized according to the anticipated number of bonded connections that will be needed.
3. SBBs shall be sized according to the anticipated number of bonded connections needed.
4. SBBs shall have tinned surfaces to restrain oxidation and shall be cleaned and have an antioxidant paste applied to both bonding surfaces prior to fastening conductors.
5. Connectors on backbone and rack/cabinet bonding conductors which attach to SBB shall be of two–hole, long–barrel compression lugs of the LCC series as specified in the "Materials" section of this document.
6. Building steel within six feet of the communications grounding system should be bonded into the system with beam clamps and other hardware appropriate to that purpose listed in "Materials" section of this document.
7. Racks and cabinets shall have individual Rack Bonding Conductors (RBC) bonding to the Telecommunications Equipment Bonding Conductor (TEBC) or underfloor "Supplemental Bonding Grid – DAISY CHAINING OR SERIAL CONNECTIONS OF ONE RACK OR CABINET TO ANOTHER WILL NOT BE ACCEPTED.
8. In smaller Telecommunications Rooms (3–5 racks) it is acceptable to have telecommunications equipment bonding conductors (TEBC) that go directly from each individual rack to the SBB. DAISY CHAINING OF RACKS WILL NOT BE ACCEPTED.
9. Rack Bonding Conductors (RBC) or above rack row grounds (TEBC) shall be installed to maintain a minimum of 2" separation from all other types of cable – power or communications.
10. To maintain this segregation of cables some telecommunications rooms may lend themselves to the installation of Auxiliary Conductor Brackets for routing bonding conductors outside of, yet parallel to ladder rack or basket tray. See "Auxiliary Brackets" in "Materials" section of this document.
11. Bonding conductor support systems like auxiliary brackets shall be spaced no further apart than three–foot intervals.
12. All cables containing metallic shielding or armor shall be properly bonded into the communications grounding system using the appropriately sized Armored Cable Grounding Kit listed in the "Materials" section of this document.
13. The illustration below depicts for reference the general location and layout of a typical telecom room and associated bonding connections into the SBB.

J. Bonding within Racks and Cabinets:
1. Racks and Cabinets shall be bonded into the communications bonding network with conductors of #6 AWG or larger.
2. Depending on size of the telecommunications room, Rack Bonding Conductors (RBC) may tap into underfloor or overhead grounding conductors, or for smaller TRs (3–5 racks or cabinets), may go directly from the rack to the wall mounted busbar.
3. Racks, cabinets and similar enclosures shall not be attached serially, (daisy–chained) but must have individual RBC into the grounding system.

4. Newly installed racks and cabinets shall have vertical grounding busbars installed along one rail to provide clean bonding landing point for all rack mount equipment. For part numbers vertical busbars see "Materials" section of this document. Grounding busbars shall not be isolated from the rack or cabinet.
5. All painted components of racks/cabinets shall be assembled using serrated grounding washers and thread–forming screws to ensure electrical continuity between the different structural components of the rack/cabinet.
6. Larger equipment (chassis switches) with integral grounding terminals or pads shall be bonded to the vertical busbar with equipment grounding kits attached to those terminals and bonding them to the rack–mounted busbars. For kit part numbers see the "Materials" section of this document.
7. Anywhere two metallic surfaces are to be bonded, contractor shall clean the contact areas of paint or oxidation using abrasive pads and apply film of anti–oxidation compound between surfaces prior to bonding.
8. All cable fittings shall be of two–hole (LCC series) compression–type. Mechanical screw–lugs on racking systems will not be accepted and must be removed and replaced at contractor's expense.
9. All screws used to affix compression lugs to rack–mounted vertical busbars shall be of the thread forming type made specifically for electrical bonding.
10. Smaller equipment (servers, TOR switches) not having integral grounding pads must be bonded to the rack through the equipment mounting flanges using green thread–forming grounding screws with serrations under the head to cut through paint, coatings and oxidation that may be present on the equipment flange. Such equipment shall have minimally one grounding screw per piece of equipment.
11. Existing (installed) racking systems containing live active equipment may be retrofitted for Standards–compliant bonding using rack retrofitting kits listed in the "Materials" section of this document.
12. ESD (electro–static discharge) ports and wrist straps shall be provided minimally every other rack or bay to be within reach of any active equipment. On larger 4–post racks or cabinets – ESD ports and wrist straps shall be installed on the front and back to be accessible when servicing any active equipment.
13. As a condition of employment, any internal or contracting technicians servicing active equipment must be wearing a properly grounded wrist strap to dissipate ESD charges prior to touching any of the owner's active equipment.

3.03 FIELD QUALITY CONTROL

A. On installations confined to a single telecommunications room, the installing contractor shall visually verify continuity of communications bonding system from equipment, through racking systems, to overhead or underfloor backbone to the wall mounted busbar in that telecommunications room.

B. Contractor shall further verify the use of all appropriate bonding accessories in the racking systems such as grounding washers, thread–forming grounding screws and the presence of electro–static discharge ports and wrist straps within reach of all equipment to be maintained.

C. On greenfield (new) projects involving installation of a building–wide telecommunications backbone, installing contractor is further responsible for visually verifying sizing and sound installation of the telecommunications bonding backbone including presence of properly sized and installed grounding equalizer conductors between backbones contained in separate risers.

D. Inspecting Contractor shall verify that any conduit longer than 3 feet through which a grounding conductor passes is properly bonded to the grounding conductor as described in this document.

E. During inspections contractor shall verify compliance with all stipulations specified in this document and compliance with all regulatory references (Standards and Codes) cited.

F. All opens or gaps in the bonding system during final inspections will be recorded in the inspection report and remedied.

G. During inspections, contractor shall check all grounding and bonding system conductors and connections for tightness and proper installation, including checking proper dies were used on compression taps and fittings by checking embossed die numbers on those connections.

H. KCL Engineering may request a test of 10% of bonded connections within the grounding system with a volt–ohm meter. Resistance tests taken on either side of a compression or exothermic bond shall be less than .2 (2/10) of one ohm in resistance.

I. Bonded joints to be tested may be random or individually tagged by a representative of KCL Engineering.

J. Contractor shall Test system at bonded points indicated and provide results in report form.

K. Based upon test results, KCL Engineering reserves the right to request testing on 100% of exothermic and compression bonds within the installed grounding system.

L. All bonded connections failing the test described above shall be remedied and retested by the installation contractor at contractor's expense.

3.04 IDENTIFICATION AND ADMINISTRATION

A. Provide labeling according to the requirements of:
   1. ANSI/TIA/EIA–606.
   2. Section 27 05 53 Identification for Communications Systems.

B. Primary Bonding Busbar (PBB): Label with “PBB”.

C. Secondary Bonding Busbar (SBB): Label with “SBB”.

D. Telecommunications Bonding Backbone (TBB): Label with “WARNING! TELECOMMUNICATIONS BONDING BACKBONE. DO NOT REMOVE OR DISCONNECT” Labels shall be affixed at both ends and at accessible intermediate points.

E. Grounding Equalizer (GC): “WARNING! TELECOMMUNICATIONS INTERCONNECTING BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT” Labels shall be affixed at both ends and at accessible intermediate points.

F. Bonding Conductor (BC): Label with “WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!” Labels shall be affixed at both ends and at accessible intermediate points.

3.05 INSPECTION OF THE GROUNDING SYSTEM

A. The following describes the process of properly inspecting information technology telecommunications supplemental grounding and bonding systems.

B. An answer of “yes” for each question on the inspection list indicates that the components of the grounding and bonding system have been installed to commonly referenced industry standards.

C. Use the room/rack/cabinet number space on each sheet to provide each measurement set with a unique identification number so that issues found during the inspection can be addressed later.

D. Bonding inspections for each telecommunications space:
   1. Room Number: _____

Is a Secondary Bonding Busbar (SBB) present?	
Have the following bonds been made to the SBB?	☐YES ☐NO
1. The AC electrical panel	☐YES ☐NO
2. Accessible building steel	☐YES ☐NO
3. The Mesh Common Bonding Network*	☐YES ☐NO
4. The Telecommunications Bonding Backbone**	☐YES ☐NO

E. *The Mesh Common Bonding Network (MCBN) is the conductor or group of conductors that extend from the SBB to each bay in the room. The MCBN can be installed above the bays or

under the access floor.

1. **The Telecommunications Bonding Backbone (TBB) is the conductor that bonds every SBB in the bonding network together. The TBB may not be present in every installation.

Using a clamp-on amp meter, check for AC and DC current on each of the bonds listed above. A reading of zero amps AC and DC may be indicative of an open connection. A reading of greater than one amp may be indicative of fault conditions somewhere in the power system. Clamp the meter around the grounding conductor in question	
Are the AC and DC currents at acceptable levels, between 0-1 amps?	□YES □NO
Are the bend radii of all these conductors greater than twelve inches?	□YES □NO
Are all the bonds to the SBB made with two-hole compression lugs?	□YES □NO
Is each conductor bonded to the SBB labeled or tagged “Do not disconnect”?	□YES □NO

F. Bonding inspections for each Rack:

1. Rack Number: _____

Are electrostatic discharge (ESD) wrist strap ports available on the front and back of each rack?	□YES □NO
Are two-hole compression lugs and compression HTAPs used wherever possible?	□YES □NO
Using a two-point resistance meter, measure the DC resistance between the common bonding network (CBN) to rack jumper and the HTAP connecting the jumper to the mesh common bonding network.	
Is the DC resistance less than or equal 0.1 ohms?	□YES □NO
Using a two-point resistance meter, measure the DC resistance between each section of the rack and the common bonding network.	□YES □NO
Is the DC resistance less than or equal 0.1 ohms?	□YES □NO

G. Bonding inspections for each Cabinet:

1. Cabinet Number: _____

Are electrostatic discharge (ESD) wrist strap ports available on the front and back of each cabinet?	□YES □NO
Are two-hole compression lugs and compression HTAPs used wherever possible?	□YES □NO
Using a two-point resistance meter, measure the DC resistance between the common bonding network (CBN) to cabinet jumper and the HTAP connecting the jumper to the mesh common bonding network.	
Is the DC resistance less than or equal 0.1 ohms?	□YES □NO
Using a two-point resistance meter, measure the DC resistance between equipment mounting rails and the common bonding network jumper. Is the DC resistance less than or equal 0.1 ohms?	□YES □NO
Using a two-point resistance meter, measure the DC resistance between the	

mounting flange of each piece of powered equipment and the common bonding network to rack jumper.	
Is the DC resistance less than or equal 0.1 ohms?	☐YES ☐NO

H. Bonding inspections for shielded cables:

1. Rack/Cabinet Number: _____

Has the bay passed all the rack or cabinet bonding inspections from above?	☐YES ☐NO
Using a two-point resistance meter, measure the DC resistance between each cable shield and the common bonding network to rack jumper.	
Is the DC resistance less than or equal 0.1 ohms?	☐YES ☐NO

END OF SECTION 27 0526

SECTION 27 0528
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and fittings.

B. Optical-fiber-cable pathways and fittings.

C. Junction Boxes

D. Devices Boxes

1.02 RELATED REQUIREMENTS

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

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 26 0526 - Grounding and Bonding for Electrical Systems
   2. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
   3. Section 27 0526 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS
   4. Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING
   5. Section 27 1000 - STRUCTURED CABLING
   6. Section 27 5129.13 - RESCUE ASSISTANCE SIGNALING SYSTEMS

1.03 ABBREVIATIONS AND ACRONYMS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.04 DEFINITIONS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.05 CODE REFERENCES AND STANDARDS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.06 SUBMITTALS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.07 QUALITY ASSURANCE

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.08 DELIVERY, STORAGE, AND HANDLING

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 2 PRODUCTS

2.01 CONDUIT AND FITTINGS

A. Approved Manufacturers:
   1. Allied Tube & Conduit
   2. Western Tube & Conduit Corp.
   3. Wheatland Tube Company
   4. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Conduit types:

1. EMT shall be steel, hot-dipped galvanized or electro-galvanized, with an inner coating to protect cables and aid pulling, UL listed, and meeting the requirements of UL 797 and ANSI C80.3.
2. RMC shall be steel, hot-dipped galvanized inside and outside with factory threaded ends full cut and galvanized after threading, UL listed, and meeting the requirements of UL 6 and ANSI C80.1.
3. RNC shall be PVC Schedule 40 rigid plastic unless otherwise noted on the Drawings, shall be rated for use with 90 degree C wire, and shall conform to UL 651, WC-1094C and NEMA TC2.
4. Flexible (flex) conduit: Flex conduit is not approved and not acceptable. Where, in rare instances, flex conduit is the only remaining viable option, the Contractor shall notify the Engineer and await the Engineer's direction prior to procurement and installation.
5. Conduit bodies (LB's): Conduit bodies (LB's) are not approved and are not acceptable.

C. Fittings:
1. Provide fittings as follows:
a. EMT fittings shall be steel compression type with a nylon insulated throat for rain-tight and concrete-tight applications, steel set screw type or steel compression type for all other connections. Conduit ends shall be fitted with bushings - bushings shall be threaded type for RMC and IMC, set screw type for EMT, and have a nylon insulated throat.
b. RMC fittings shall be threaded galvanized steel. Conduit ends shall be fitted with bushings - shall be threaded and have a nylon insulated throat.
c. RNC fittings shall be of same material and manufacturer as the conduit and shall be UL listed and conform to UL 514.
2. Expansion fittings shall be provided across structural joints, shall be of a design to compensate for expansion and contraction, and shall be sealed to prevent entrance of water and moisture, and shall safely deflect and expand up to twice the distance of the structural movement. Expansion fittings shall be approved for grounding duty.
3. Minimum Trade Size:
a. Communication systems conduit: 1 inch.

D. Joint Compound for EMT, RMC, or RNC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Approved Manufacturers:
1. Comstar Supply
2. Endot Industries Inc.
3. Carlon Sales
4. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Description: Comply with UL 2024; flexible-type pathway with a circular cross section, approved for plenum, riser, or general-use installation unless otherwise indicated.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.03 JUNCTION BOXES

A. Approved Manufacturers:
1. Hubbell/Raco
2. Garvin Industries
3. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Junction boxes shall be provided to serve as a transition point between pathways/raceways. Junction boxes shall be galvanized stamped steel, deep drawn one piece (without welds or tab connections), with knockouts for conduit entrances, meeting NEMA OS 1.

C. Junction boxes shall not be placed in non-accessible ceiling locations unless specifically shown on the Communications Construction Drawings or approved in writing by the Engineer prior to rough-in and installation.

D. Junction boxes in locations other than walls shall be sized according to the NEC.

E. Junction boxes in walls:
   1. Unless otherwise shown on the Drawings, junction boxes shall be 4-11/16 inch by 4-11/16 inch by 2-1/8 inch deep with blank cover, and knockouts pre-manufactured to support the conduit size serving the junction box.
   2. Size according to the NEC and provide the larger of the minimum size mentioned above or the NEC requirements.

2.04 DEVICE BOXES

A. Approved Manufacturers:
   1. Hubbell/Raco
   2. Garvin Industries
   3. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Device boxes shall be galvanized stamped steel, deep drawn one piece (without welds or tab connections), with knockouts for conduit entrances, meeting NEMA OS 1, and equipped with extension rings to suit construction and application.

C. Device Box Types:
   1. Device Box: Typically installed as an empty box with faceplate, conduit and pull string for future use, unless specifically noted otherwise on the Communications Construction Drawings.
      a. Shall be a minimum 4-11/16 inch by 4-11/16 inch by 2-1/8 inch deep capable of accepting a minimum of (2) 1 inch conduits.
      b. Shall be equipped with a minimum single-gang mud ring unless otherwise noted on the Drawings.
      c. Provide a blank faceplate to match the material, style and color being used on the Electrical Wiring Devices
   2. Outlet Box: Outlet boxes shall be provided to house Communications System outlets and connectors. Unless otherwise noted in the Communications Construction Drawings the typical Outlet Box(es) shall be as follows:
      a. Shall be a minimum 4-11/16 inch by 4-11/16 inch by 2-1/8 inch deep capable of accepting a minimum of (2) 1 inch conduits.
      b. Shall be equipped with a minimum single-gang mud ring unless otherwise noted on the Drawings.
      c. Provide a cover plate in lieu of a single-gang mud ring at Wireless Access Point locations.

PART 3 EXECUTION

3.01 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
   1. Exposed Conduit: RNC, Type EPC-80-PVC.
   2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
   4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below 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: GRC. Pathway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Gymnasiums
4. Concealed in Ceilings and Interior Walls and Partitions: EMT, RNC, Type EPC-40-PVC, or innerduct.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, communications cable pathway.
7. Pathways for Optical-Fiber or Communications Cable Risers in Vertical Shafts:Riser-type optical fiber cable
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical fiber cable pathway.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 1 inch trade size for communications cables .

D. Pathway Fittings: Compatible with pathways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   3. EMT: Use set-screw, steel fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
   1. NECA 1.
   2. NECA/BICSI 568.
   3. TIA-569-D.
   4. NECA 101
   5. NECA 102.
   6. NECA 105.
   7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.

E. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

F. Complete pathway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

J. Support conduit within 12 inches of enclosures to which attached.

K. Pathways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
   2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
   3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
   4. Do not embed thread-less fittings in concrete unless specifically approved by Architect for each specific location.
   5. Change from nonmetallic conduit and fittings to RNC, Type EPC-40-PVC and fittings before rising above floor.

L. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for pathways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

P. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

S. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

T. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
   1. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
   2. Install with a maximum of two 90-degree bends or equivalent for each length of pathway 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.

U. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, 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 pathway-sealing fittings according to NFPA 70.

V. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

X. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC that is located where environmental temperature change may exceed 100 deg F, and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Z. 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. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

AA. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.

3.04 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.05 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 27 0528

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SECTION 27 0544
SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sleeves.

B. Firestop Sealants.

C. Firestop Putty.

1.02 RELATED REQUIREMENTS

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

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
   2. Section 27 0526 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS
   3. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS
   4. Section 27 1000 - STRUCTURED CABLING

1.03 ABBREVIATIONS AND ACRONYMS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.04 DEFINITIONS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.05 CODE REFERENCES AND STANDARDS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.06 SUBMITTALS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.07 QUALITY ASSURANCE

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.09 WARRANTY

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

PART 2 PRODUCTS

2.01 GENERAL

A. Use only fire-stopping products that have been tested for specific fire resistance rated construction conditions confirming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

2.02 SLEEVES

A. Approved Manufacturers:
   1. Specified Technologies, Inc. - EZ-Path

2. Hilti - Speed Sleeve
3. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Wall and Floor Sleeves:
1. Fire-rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur, such devices shall:
   a. Meet the hourly rating of the floor or wall penetrated.
   b. Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.
   c. Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:
      1) Opening or closing of doors.
      2) Twisting an inner liner.
      3) Removal or replacement of any material such as, but not limited to, sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.
   d. Permit multiple devices to be ganged together to increase overall cable capacity.
   e. Allow for retrofit to install around existing cables.
   f. Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes.
2. Where single cables penetrate gypsum board/stud wall assemblies, a fire-rated cable grommet may be substituted. Acceptable products shall be molded from plenum-grade polymer and conform to the outer diameter of the cable forming a tight seal for fire and smoke. Additionally, acceptable products shall lock into the barrier to secure cable penetration.
3. Where non-mechanical products are utilized, provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.
4. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.
5. Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.
6. Treat all wall penetrations that are required as a minimum of one a 1-hour rated wall. It shall also be assumed that any existing penetration used by a contractor for cabling is “owned” by that contractor. They shall be responsible for providing the appropriate fire-stopping materials to fire-stop the penetration regardless of whether fire-stopping existed at the beginning. Any fire-stopping material removed during cable installation shall be replaced with like material.

2.03 FIRESTOP SEALANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Specified Technologies, Inc. - SpecSeal Series SSS Sealant
2. Specified Technologies, Inc. - SpecSeal Series LCI Sealant
3. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Firestop Sealants: This shall be a single component latex formula that upon curing shall not re-emulsify during exposure to moisture. Firestop sealants shall be used to fill annular space around and between the wall substrate and sleeve.

2.04 FIRESTOP PUTTY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Specified Technologies, Inc. - SpecSeal SSP Putty
   2. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

B. Firestop Putty: This shall be intumescent, non-hardening, water resistant putty containing no solvents, inorganic fibers or silicone compounds.

C. Firestop Putty shall be used to seal through-penetrations such as traditional conduit sleeves.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION FOR COMMNICATION SYSTEMS PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Penetrating Above-Grade Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Walls and Floors:
      a. Seal annular space between sleeve and pathway, using fire-stop sealant appropriate for size, depth, and location of joint.
   2. Use the fire-rated prefabricated sleeve assembly as specified unless penetration arrangement requires rectangular sleeved opening. Rectangular openings shall require firestop pillows to block the annular space of a fire-rated wall.
   3. Install sleeves for wall penetrations. Perform core drilling as required to install/set the prefabricated assembly into its designated location.
   4. Install sleeves during erection of walls.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors a minimum of 2 inches above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Fire-Rated Gypsum Board Assemblies:
   1. Use the fire-rated prefabricated sleeve assembly as specified unless penetration arrangement requires rectangular sleeved opening.
   2. If conduit was utilized, seal space outside of sleeves with approved firestop compound/sealant for gypsum board assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE SYSTEM INSTALLATION

A. Install through-penetration fire-stop systems and fire-resistive joint systems in accordance with the manufacturer's instructions.
   1. Seal all openings or voids made by penetrations to ensure an air and water-resistant seal.
   2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of through-penetration firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
   3. Protect materials from damage on surfaces subjected to traffic.
   4. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition might occur such as the intersection of a gypsum wallboard/steel stud wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.

B. Perimeter Containment: Comply with manufacturer's instructions for installation of perimeter fire containment system products.
   1. Seal all slab-edge openings to ensure an air and water-resistant seal.
   2. Curtain wall insulation that is an integral component of the perimeter fire containment system shall be in accordance with the conditions of testing and classification as specified in the design and shall comply with thermal insulation requirements as specified in Section 07 210 Building Insulation.

C. Install 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.

3.03 IDENTIFICATION

A. Comply with Section 27 0553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS.

B. A firestop identification label shall be applied to the wall substrate adjacent to the through penetration or joint firestop system.

C. At a minimum, the label shall contain the following information:
   1. Firestop identification per Section 27 0553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS.
   2. Fire stop product/system used
   3. Installation Company
   4. Penetration Hour Rating
   5. Installation Date

3.04 FIELD QUALITY CONTROL

A. Keep areas of work accessible until inspection by authorities having jurisdiction.

B. Where deficiencies are found, repair or firestopping products so they comply with requirements.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

END OF SECTION 27 0544

SECTION 27 0553
IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Color and legend requirements for labels and signs.

B. Labels.

1.02 RELATED REQUIREMENTS

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

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
   2. Section 27 0526 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS
   3. Section 27 1000 - STRUCTURED CABLING

1.03 ABBREVIATIONS AND ACRONYMS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.04 DEFINITIONS

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.05 CODE REFERENCES AND STANDARDS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.06 SUBMITTALS

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.07 QUALITY ASSURANCE

A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.02 COLOR AND LEGEND REQUIREMENTS

A. Identification Labels:
   1. Black letters on a white field.

2.03 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible labels with acrylic pressure-sensitive adhesive.
   1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

C. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
   1. Minimum Nominal Size:
      a. 1-1/2 by 6 inches for raceway and conductors.
      b. 3-1/2 by 5 inches for equipment.
      c. As required by authorities having jurisdiction.

PART 3 EXECUTION

3.01 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.02 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Polyester Wraparound Labels:
   1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
   2. Attach labels that are not self-adhesive type with clear tape, with adhesive appropriate to the location and substrate.
   3. Provide label 6 inches from cable end.

I. Self-Adhesive Wraparound Labels:
   1. Secure tight to surface at a location with high visibility and accessibility.
   2. Provide label 6 inches from cable end.

J. Self-Adhesive Labels:
   1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

3.03 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.
   1. System legends shall be as follows:
      a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, composed of the following, in the order listed:
   1. Wiring closet designation.
   2. Dash.
   3. Work area outlet number.

E. Equipment Room Labeling:
   1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
   2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
   3. Data Outlets: Label each outlet with a self-adhesive label using the same scheme defined under Faceplates.

F. Backbone Cables: Label each cable with a polyester self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a polyester self-adhesive wraparound label indicating the following, in the order listed:
   1. Room number.
   2. Colon.
   3. Faceplate number.

END OF SECTION 27 0553

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SECTION 27 1000
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

B. Section 27 0526 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS.

C. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS.

D. Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.

E. Section 27 0553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable 2021.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices 1988a (Reaffirmed 2012).

F. TIA-492AAAA - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009b.

G. TIA-492AAAB - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009a.

H. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009b.

I. TIA-492AAAD - Detail Specification for 850-nm Laser- Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber 2009.

J. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers 1998 (Reaffirmed 2002).

K. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak 2000 (Reaffirmed 2005).

L. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement 2015a (Reaffirmed 2022).

M. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Modification of IEC 61280-4-1 Edition 2, Fiber-Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant-Multimode Attenuation Measurement 2015c.

N. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2020.

O. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009c, with Addendum (2016).

P. TIA-568.3 - Optical Fiber Cabling and Components Standard 2016d.

Q. TIA-569 - Telecommunications Pathways and Spaces 2019e.

R. TIA-598 - Optical Fiber Cable Color Coding 2014d, with Addendum (2018).

S. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.

T. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.

U. UL 444 - Communications Cables Current Edition, Including All Revisions.

V. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.

W. UL 1651 - Fiber Optic Cable Current Edition, Including All Revisions.

X. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify the Design Team of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Refer to Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.06 QUALITY ASSURANCE

A. Refer to Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

1.08 WARRANTY

A. Refer to Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Comply with Communications Service Provider requirements.

3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
1. Building Entrance Cable: By others.
2. Backbones - Within Building (Police Conference Room to new Server Room): Fiber optic, 6-strand singlemode -fiber.
3. Backbones - Between Buildings (Police Conference Room to City Hall): Fiber optic, 6-strand singlemode -fiber.
4. Provide infrastructure and outlets where indicated on drawings.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets and backbone cables that extend to intermediate distribution frames (IDFs), functioning as point of presence to external service provider.
1. Locate main distribution frame as indicated on the drawings.
2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
1. Locate intermediate distribution frames as indicated on the drawings.

E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Conduit, Pull Boxes, and Hooks: As specified in Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS; provide pull cords in all conduit.

B. Firestop Sleeves: As specified in Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

2.03 COPPER CABLE AND TERMINATIONS

A. Manufacturers (End-to-End):
1. CommScope
2. Belden
3. Siemon
4. Panduit
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Copper Horizontal Cable:
1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Work Area Outlet Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   a. Color: Blue
3. Cable Type - Wireless TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   a. Color: Blue
4. Cable Type - Surveillance Cameras TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   a. Color: Blue
5. Cable Capacity: 4-pair.

6. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
7. End-to-End Solution Product(s):
   a. CommScope; Uniprise Twisted Pair Cables; CS37 Series Category 6 U/UTP Cable.
   b. Belden; DataTwist Twisted Pair Cables; 3600 Series Category 6 U/UTP Cable.
   c. Siemon; Twisted Pair Cables; Premium 6 Series Category 6 U/UTP Cable.
   d. Panduit; Twisted Pair Cables; TX6500 Series Category 6 U/UTP Cable

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
3. End-to-End Product(s):
   a. CommScope
   b. Belden
   c. Siemon
   d. Panduit

E. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each patch panel port.
   b. Length: 12"
   c. Color: Coordinate specific color requirements with the design team prior to ordering.
3. Patch Cords for Work Areas:
   a. Quantity: One for each work area outlet port.
   b. Length: 15 feet.
   c. Color: Coordinate specific color requirements with the design team prior to ordering.
4. Product(s):
   a. Provide products from the approved cable/connectivity manufacturer. Products shall be compatible and compliant with the cable channel and meet or exceed the Category rating of the horizontal permanent link.

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:
1. Corning
2. CommScope
3. Belden
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fiber Optic Backbone Cable - Indoor Non-Conductive (Police Conference Room to Server Room):
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Single-mode, 8.3/125 um (OS1) complying with TIA-492CAAA.
3. Cable Capacity: 6-strand singlemode -fiber.
4. Cable Applications:
   a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
5. Cable Jacket Color:
   a. Single-Mode Fiber (OS1/OS2): Yellow.
6. Product(s):
   a. CommScope Fiber Optic Cables; TeraSpeed Zero Water Peak Single-Mode Fiber.

C. Fiber Optic Backbone Cable Indoor/Outdoor Conductive:
   1. Description: Tight buffered, armored/conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
   2. Cable Type: Single-mode, 8.3/125 um (OS1) complying with TIA-492CAAA.
   3. Cable Capacity: 6-strand singlemode -fiber.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type OFCP plenum cable.
   5. Cable Jacket Color:
      a. Single-Mode Fiber (OS1/OS2): Yellow.
   6. Product(s):
      a. CommScope Fiber Optic Cables; TeraSpeed Zero Water Peak Single-Mode Fiber.

D. Fiber Optic Interconnecting Devices:
   1. Connector Type: Type LC.
   2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
   3. Maximum Attenuation/Insertion Loss: 0.3 dB.

E. Fiber Optic Patch Cords:
   1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
   2. Patch Cords for Patch Panels:
      a. Quantity: One for each pair of patch panel ports.
      b. Length: 10 Feet.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
   1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
      a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
      b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
      c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
      d. Provide incoming cable strain relief and routing guides on back of panel.
   2. Product(s):
      a. Modular patch panels (flat) compatible with the approved copper cabling and connector products.

B. Fiber Optic Cross-Connection Equipment:
   1. Manufacturers:
      a. Corning
      b. CommScope
      c. Belden
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
      a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; modular cassette(s) with a maximum of 24 duplex adaptors per standard panel width.
      b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
      c. Provide incoming cable strain relief and routing guides on back of panel.
      d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
      e. Provide dust covers for unused adapters.
      f. Quantity: Provide cassette(s) to terminate all incoming/outgoing strands of fiber.

3. Product(s):
    a. Corning; Closet Connector Housing; CCH Series Enclosures.
    b. Commscope; SD Series Enclosures.
    c. Belden; FX ECX Series Enclosures.

C. Backboards: AC plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
1. Size: As indicated on drawings.
2. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:
1. Manufacturers:
    a. Chatsworth
    b. Hoffman
    c. Ortronics
    d. Substitutions: See Section 01 6000 - Product Requirements.
2. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
3. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
4. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.
5. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
6. Cabinets: Steel construction with corrosion resistant finish.
7. Locks: Keyed alike.
8. Product(s):
    a. Refer to the Drawings for specific requirements.

E. Cable Management:
1. Manufacturers:
    a. Chatsworth
    b. Hoffman
    c. Ortronics
2. Product(s):
    a. Refer to the Drawings for specific requirements.

2.06 COMMUNICATIONS OUTLETS

A. Manufacturers:
1. CommScope
2. Belden
3. Panduit
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Outlet Boxes: Comply with Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
    a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

C. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
    a. Data or Combination Voice/Data Outlets: 4 ports.

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726.

2.07 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 27 0526 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS.

2.08 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches (300 mm) from power conduits and cables and panelboards.
   3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
   4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Conduit, in Addition to Requirements of Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS:
   1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
   2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
   3. Arrange conduit to provide no more than 100 feet (30 m) between pull points.
   4. Do not use conduit bodies.

C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS as required for installation of telecommunications outlets provided under this section.
      a. Mounting Heights: Unless otherwise indicated, as follows:
         1) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
         2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 54 inches (1.4 m) above finished floor to top of telephone.
         3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches (1.2 m) above finished floor to top of telephone.
      b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
      d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
      e. Locate outlet boxes so that wall plate does not span different building finishes.
      f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches (3000 mm).

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
   3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
   1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
   2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
   1. Install to plywood backboards only, unless otherwise indicated.
   2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.
   4. Inspect patch cords for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Utilizing testing equipment equivalent to Fluke DTX/DSX:
      a. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
      b. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
      c. Ensure each run of cabling passes testing and is compliant with the listed Category classification. Provide test results during closeout procedures.

E. Testing - Fiber Optic Cabling:
   1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
   2. Multimode Backbone: Perform tests in accordance with TIA-526-14.

3. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
4. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION 27 1000

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SECTION 27 5129.13
RESCUE ASSISTANCE SIGNALING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Area of refuge/rescue assistance emergency communication system and associated call stations, control stations, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0533.13 - Conduit for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

C. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.

G. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for area of refuge/rescue assistance system components.
   2. Coordinate the work with other installers to provide communication lines required for control station timed automatic connection to designated constantly attended monitoring location.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install call stations and control station(s) until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.

D. Design Data: Include standby battery calculations.

E. Evidence of qualifications for installer.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. ADA Standards.
   2. ICC (IBC) (International Building Code).
   3. NFPA 70 (National Electrical Code).
   4. NFPA 101 (Life Safety Code).
   5. The requirements of the local authorities having jurisdiction.
   6. Applicable TIA/EIA standards.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Area of Refuge/Rescue Assistance Communication System:
   1. Cornell Communications; [_____]: www.cornell.com/#sle.
   2. Housing Devices, Inc; [_____]: www.housingdevices.com/#sle.
   3. Rath Microtech; [_____]: www.area-of-refuge.com/#sle.

B. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

C. Source Limitations: Furnish system components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 AREA OF REFUGE/RESCUE ASSISTANCE COMMUNICATION SYSTEM

A. Provide new area of refuge/rescue assistance communication system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description:
   1. Call Stations: Located at each designated area of refuge/rescue assistance as indicated on drawings, unless otherwise directed by authorities having jurisdiction.
   2. Master Control Station: New, located as indicated on drawings, unless otherwise directed by authorities having jurisdiction.
   3. System battery backup is required.
   4. Timed automatic connection to designated constantly attended monitoring location is required.
   5. Minimum Number of Zones Supported: As required for call stations/zones indicated.

C. System Operation:
   1. When a call for assistance is initiated at call station:

a. Provide audible and visual notification at call station to confirm that call has been placed.
b. Provide audible and visual notification at control station(s) that call has been placed and annunciate the location of the call station/zone that initiated a call.
c. Maintain visual notification of each call location at control station(s) until manually reset by control station operator.
d. Maintain audible notification at control station(s) that call(s) have been placed until call is acknowledged by control station operator.
e. Maintain visual notification at call station until manually reset by control station operator.

2. When a call for assistance is acknowledged at control station:
   a. Provide visual notification at control station that call has been acknowledged.
   b. Provide visual notification at call station that call has been received.
   c. Establish two-way voice communication between call station and control station.
3. When a call has not been acknowledged during a programmed time delay to allow for local response, automatically initiate call to listed remote monitoring station under contract with facility, send signal identifying specific building, and establish two-way voice communication.

D. Call Station(s):
1. Suitable for the environment where installed.
2. Finish: Painted steel or stainless steel.
3. Mounting: As indicated on drawings.
4. Provides means to initiate call for assistance.
5. Provides for distinct audible and visual notification to confirm that call has been placed and for distinct visual notification that call has been acknowledged.
6. Following initial call for assistance, provides for hands-free two-way communication with control station(s).

E. Control Station(s):
1. Suitable for the environment where installed.
2. Mounting: As indicated on drawings.
3. Provides visual notification that system is operational.
4. Provides for distinct audible and visual notification of calls with annunciation of call station/zone locations.
5. Provides for two-way communication with selected call stations.
6. Provides for supervision of system wiring and provides distinct audible and visual notification of faults.
7. Audible Notification Sound Level: Not less than 90 dB.

F. Accessories:
1. Provide components as indicated or as required for a complete operating system.
2. Wiring: Provide manufacturer's recommended cables as indicated or as required for connections between system components, and in accordance with wiring methods indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Mounting Heights:
1. Call Stations: Comply with applicable accessibility requirements.
2. Control Stations: Comply with applicable accessibility requirements.

D. Wiring Method:
1. Use 2-hour fire-rated circuit integrity (CI) cable or 2-hour fire-rated mineral-insulated, metal-sheathed (MI) cable in accordance with NFPA 72 Level 2/Level 3 pathway

survivability requirements.

a. Exception: Buildings of less than 2-hour fire-rated construction that are fully protected by an automatic sprinkler system, where cables are installed in metal raceway or metal armored cables are utilized in accordance with NFPA 72 Level 1 pathway survivability requirements.

2. Provide Class A system wiring in accordance with NFPA 72 pathway performance requirements.
3. Use listed plenum rated cables in spaces used for environmental air.
4. Install wiring in conduit where required for rough-in, where required by authorities having jurisdiction, and where exposed to damage.
5. Conduit: Comply with Section 26 0533.13.
6. Conceal all cables unless specifically indicated to be exposed.
7. Route exposed cables parallel or perpendicular to building structural members and surfaces.

E. Provide grounding and bonding in accordance with Section 26 0526.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

G. Identify system wiring and components in accordance with Section 26 0553.

H. Identify zones at control station(s) to indicate call station locations.

I. Provide required instructional signage at each call station.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's field reports with submittals.

C. Test to verify wiring is free of shorts and grounds.

D. Prepare and start system in accordance with manufacturer's instructions.

E. Test system for proper operation.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.03 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

END OF SECTION 27 5129.13

SECTION 28 0000
GENERAL REQUIREMENTS FOR ELECTRONIC SAFETY & SECURITY SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Division 28 specifications are provided to define the standards and criteria to be used to bid, plan, furnish, install, test, and document electronic safety & security systems for City of Reedsport Station 7 Seismic Improvements and Renovation . These specifications shall form the basis for implementation of the design, installation, inspection, and close-out process.

B. Division 28 has been designed and developed based on the most current and adopted International Series Building and Fire Code, Facility Guidelines, OSSC Code and Amendments, NFPA 72, NFPA 70 (NEC), and National Electrical Safety Code (NESC) requirements. The requirements within those documents are not superseded herein unless specifically stated. Code requirements are unable to be superseded by this document at any time. The absence of a specific reference to an element within the aforementioned codes, and standards does not relieve all parties of compliance with them.

C. Within this document use of the word “shall” marks mandatory requirements. Use of the word “may” or “should” suggests optional elements. All conflicts within this document shall be resolved by the General Contractor in consultation with the Design Team. The standards of City of Reedsport shall take precedence in the resolution of any dispute.

D. Unauthorized changes and/or deviations from these specifications, regardless of scale, may result in re-design, reconstruction, or re-installation of communications elements at the contractor’s expense. Contractors shall obtain formal written approval prior to bidding and prior to installation in order to deviate from these specifications. Contractors shall not deviate from code requirements.

E. Division 28 Specifications address information transport pathways, multiple different types of Safety and Security systems, spaces, media, grounding, identification, testing, and documentation requirements in support of multiple information transport infrastructures.

F. Specific responsibilities of Division 28 include, but are not limited to:
   1. Installation of the intra-building pathways, cabling, and coordinating space requirements necessary to house the safety and security systems and associated electronic information transport equipment. Pathways and spaces shall be provided to support the known systems and cabling requirements, as well as provisions for those that may be required in the future for growth purposes.
   2. The procurement and installation of each safety and security system and the associated components and cabling to create a fully functional system.
   3. Thorough testing shall be conducted of each individual safety and security system to illustrate compliance with specific performance requirements.
   4. Definition and establishment of administration and labeling schemes, conforming to Owner's requirements.
   5. Securing all necessary permits and licenses, payment of all fees, and provision of all construction work notifications.
   6. Compliance with all applicable laws, ordinances, rules, and regulations.
   7. Mandatory project manager attendance at a weekly project status meeting with the General Contractor.
   8. It is the intent of the project drawings and specifications to provide complete and fully functional Division 28 safety and security systems, ready for use. Any item, not specifically shown in the project drawings or called for in the project specifications but normally required for a complete systems, is to be considered a part of this contract.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 00 & 01 Specification Sections, apply to this section.

B. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS.
   2. Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.
   3. Section 27 0553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS.
   4. Section 28 0505 - SELECTIVE DEMOLITION OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.
   5. Section 28 2000 - VIDEO MANAGEMENT SYSTEM.

1.03 ABBREVIATIONS AND ACRONYMS

A. The following definitions are applicable to the work as indicated and as shown herein:
   1. AC - Alternating Current
   2. ANSI -American National Standards Institute
   3. API - Application Programming Interface
   4. AWG - American Wire Gauge
   5. CFR - Code of Federal Regulations
   6. CSI - Construction Specifications Institute
   7. DC - Direct Current
   8. DNS - Domain Name System
   9. DPDT - Double Pull-Double Throw
   10. DVMS - Digital Video Management System
   11. DVR - Digital Video Recorder
   12. EACS - Electronic Access Control System
   13. EMT - Electrical Metallic Tubing
   14. FACP - Fire Alarm Control Panel
   15. FCC - Federal Communications Commission
   16. FTP - File Transfer Protocol
   17. HVAC - Heating, Ventilation, and Air Conditioning
   18. ID - Identification
   19. IEC - International Environmental Corporation.
   20. IEEE - Institute of Electrical and Electronic Engineers
   21. IP - Internet Protocol
   22. IS - Integrated Systems
   23. ISO - International Organization for Standardization
   24. LAN - Local Area Networks
   25. LDAP - Lightweight Directory Access Protocol
   26. LED - Light Emitting Diode
   27. mA - Milliampere.
   28. NAS - Network-Attached Storage
   29. NECA - National Electrical Contractors Association
   30. NEMA - National Electrical Manufacturers Association
   31. NFPA - National Fire Protection Area
   32. NICET -
   33. NRTL - Nationally Recognized Testing Laboratories.
   34. NVR - Network Video Recorder
   35. ODBC - Open Database Connectivity
   36. ONVIF - Open Network Video Interface Forum
   37. OS - Operating Systems
   38. OVID - Open Video Interface Document
   39. PC - Personal Computer
   40. PIN - Personal Identification Number
   41. PIR - Passive Infrared

42. PSIA - Physical Security Interoperability Alliance
43. RAID - Redundant Array of Independent Disks
44. RFI - Radio-Frequency Interface
45. RFID - Radio Frequency Identification
46. RoHS - Restriction of Hazardous Substances Directive
47. ROM - Read Only Memory
48. SFTP - Secure File Transfer Protocol
49. SHA - Secure Hash Algorithm
50. SIA - Security Industry Association
51. SLA - Sealed Lead Acid
52. SLDAP - Secure Lightweight Directory Access Protocol
53. SMS - Security Management System.
54. SQL - Structured Query Language
55. SSL - Secure Sockets Layer
56. STI - Speech Transmission Index
57. TIA - Telecommunications Industry Association.
58. TCP - Transmission Control Protocol
59. UL - Underwriters Laboratories
60. UPS - Uninterruptible Power Supply
61. VMS - Video Management System
62. WAN - Wide Area Network

1.04 CODES AND STANDARDS

A. All work shall be in compliance with the following codes and agencies. Nothing contained within these specifications shall be misconstrued to permit work not in conformance with the most stringent of applicable codes and standards. It is assumed that bidders have access to, and specific knowledge of, the listed reference materials in order to ensure conformity with them.
   1. Oregon Structural Specialty Code (OSSC)
   2. International Fire Code
   3. Facility Guidelines Institute
   4. National Electrical Code (NEC)
   5. National Electrical Safety Code (NESC)
   6. National Fire Protection Association (NFPA)
   7. National Electronic Manufacturer’s Association (NEMA)
   8. Occupational Safety & Health Administration (OSHA)
   9. Federal Communications Commission (FCC)

B. All new materials, equipment, and installation practices shall meet the requirements of the following standards, unless specifically instructed otherwise by the Design Team.
   1. Federal, State, and local codes, rules, regulations, and ordinances.
      a. Perform all work in accordance with local jurisdiction requirements that is governing the work and as fully part of the specifications attached.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of the safety and security systems with the Electrical contractor and the Owner's selected carrier.

B. Sequencing: Ensure that any fire alarm, access control and video surveillance cutover is achieved in a coordinated and orderly manner.

C. All Division 28 Contractor Project Managers shall schedule and conduct a coordination meeting with City of Reedsport to confirm and coordinate scope of work requirements prior to commencement of work. Project meetings shall be scheduled through the general contractor.

1.06 SUBMITTALS

A. Refer to Division 1 for exact submittal procedures.

B. The Division 28 contractor shall provide for review, without exception prior to material acquisition and installation, three (3) copies of the following items. Failure to submit required items shall disqualify the bidder.
   1. Product Data Sheets (Catalog Cuts)
   2. Riser/Cabling Diagrams
   3. System Schematics
   4. Specification Sheets for Test Equipment
   5. Bill of Materials
   6. Contracting Firm Qualifications and Certifications
   7. Installation Team Qualifications by Individual
   8. Current Manufacturer Certifications

C. In addition to the above submittal information, the fire detection and alarm contractor shall also adhere to the authority having jurisdiction (local and/or state) submittal requirements. The bid represented by this contractor shall include the necessary fees required for this governing body to review the project.

D. Provide throughout installation:
   1. Material samples, if requested by the design team.
   2. Periodic field quality control reports.

E. Provide at completion of each construction phase area:
   1. System test and certification reports; summary hard copy or full test results on digital media when requested by the owner or design team. Reports shall be submitted to the requesting party within seven (7) calendar days.
   2. One (1) set of record drawings of the actual installation of the Division 28 systems. Drawings shall be given as full size originals and on digital media in AutoCAD format

F. Provide at final completion, three (3) bound sets of O&M (Operating and Maintenance) Manuals formatted as defined by Division 1 and one (1) electronic copy provided on digital media. Each copy of the O&M Manual shall include, at minimum, items listed as follows:
   1. System test and certification reports; summary hard copy and full test results on digital media. Test results shall be delivered at the completion of each project phase and at any time when called for by the Owner.
   2. Provide one (1) full-size hard copy set of record drawings (as-builts) to be submitted to the Design Team for approval, immediately upon completion of the installation.
   3. Instruction manuals including equipment and schedules, operating instructions, and manufacturer's instructions.
   4. Manufacturer warranty certificate.
   5. Warranty contacts including but not limited to: names, telephone numbers (office and mobile).

1.07 QUALITY ASSURANCE

A. Contracting firm shall constitute a company with a minimum of five (5) years successful installation experience with projects utilizing infrastructure and systems work similar to that required for this project.

B. Contractor shall provide with a manufacturer certification for the system solution bid, issued directly in the bidder’s company name, valid for the time frame in which the installation will be completed. Contractor shall be manufacturer certified in order to participate in the bid event.

C. The Contractor shall be knowledgeable in local, state, regional, and national codes and regulations. All work shall comply with the latest revision of codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall apply.

D. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific solution being installed.

E. Only installers trained and certified by the proposed manufacturer shall be allowed to install firestop products.

F. Only installers trained and certified by the proposed systems manufacturer shall be allowed to terminate and test any of the electronic safety & security systems. Others may pull cabling and install field devices under the supervision of an installer trained and certified by the manufacturer.

G. Service Qualifications: Installing and servicing contractor shall have a permanent office within a 120 mile radius of the project site.

H. Before bidding, the contractor shall study and compare all contract documents and promptly notify the Design Team of any discrepancies or deficiencies discovered by or made known to the contractor.

I. Discrepancies: Whenever a discrepancy or inconsistency exists between related information indicated on the contract drawings and/or specifications, this contractor shall obtain additional clarification and direction from the Design Team before proceeding. For bidding purposes, this contractor shall include the labor and materials necessary to comply with the solution that results in the greatest cost to the contract.
   1. If there is a conflict between applicable documents, then the more stringent requirement shall apply.
   2. The failure to question any controversial item will constitute acceptance by the bidder who shall execute it to the satisfaction of the owner after being awarded the contract.

J. Deficiencies: The contractor and associated subcontractors shall resolve all known deficiencies and omissions, including non-compliance with applicable codes, with the Design Team prior to ordering materials or proceeding with the work. Any work performed prior to receipt of instructions from the Design Team will be done so at the contractor's risk.
   1. If elements have been omitted pertaining to details, items or related accessories required for the completion of any system, it is understood such item and accessories are included in the contract. After the contract is awarded, claims based on insufficient data or incorrectly assumed conditions, or claims based on misunderstanding the nature of the work, will not be recognized.
   2. All devices, symbols and work illustrated shall be new work provided under this contract except work labeled existing to remain and equipment labeled to be furnished (or supplied) by others, but installed by this contractor.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Equipment, materials, and supplies shall be shipped, handled and stored in ways that shall prevent damage to the items.

B. All items shall be handled and stored as recommended by the manufacturer.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under manufacturer's specified conditions, and free from damage or deterioration.

D. Equipment, materials, and supplies to be incorporated in the area of work shall be new unless otherwise noted.

E. Equipment, materials, and supplies shall be produced in a good workmanlike manner.

F. When the quality of a material, process, or article is not specifically set forth in the Drawings or Specifications, the best available quality of the material, process, or article shall be provided.

1.09 FIELD CONDITIONS

A. Conditions and Measurements: Visit the jobsite to verify installation conditions and confirm measurements for all required systems and associated cabling connectivity.

1.10 WARRANTY

A. The Contractor shall submit, in the bid documents, any additional contractor-specific warranties or guarantees to be offered on the project.

B. The Contractor shall supply any and all necessary documentation needed to process and record the warranty(s) and to verify the installation solution.

C. Unless listed elsewhere within these specifications, a warranty shall be provided for a minimum of one (1) year for all safety and security systems. One year shall begin from the date of Substantial Completion. This warranty shall cover both product and service to address remedial maintenance and replacement parts as is appropriate to keep each system complete and fully functional.

PART 2 PRODUCTS

2.01 MANUFACTURER'S, PRODUCTS, AND SERVICES

A. If a bidder proposes to substitute an article, device, material, equipment, form of construction, fixture, or item other than the approved manufacturers and part numbers, listed and named in the specifications, the bidder shall certify that the proposed item is equal in quality and all aspects of performance and appearance, to the items specified. The bidder shall submit a request for substitution to the Design Team by following the instruction in Specification Section 01 6000, which must include:

1. The name and complete description of the proposed Substitution including Drawings, performance and test data, and other information necessary for a complete evaluation; and
2. A statement setting forth any changes that the Proposed Substitution will require in the Contract Documents or the project.

B. If the Design Team approves the proposed substitution, the Design Team shall issue an Addendum. If the Design Team does not approve the substitution, the Design Team shall inform the bidder of its decision, which is final. The Design Team may reject a proposed Substitution because the bidder failed to provide sufficient information to enable the Design Team to completely evaluate the proposed substitution without causing a delay in the scheduled bid opening.

C. Proposed substitutions received by the Design Team after the allotted time allowed by Section 01 6000 shall not be considered.

D. Bidder shall confirm all reference part numbers, listed within Division 28, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.

E. All materials associated with reference parts shall be included so as to constitute a complete and functional system, whether or not specifically identified and itemized.

F. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will provide service to the project site within two (2) hours of receipt of notification that service is needed. Submit name and address of service organizations during the submittal process.

2.02 SLEEVES FOR PATHWAYS AND CABLES

A. Where additional conduits are needed beyond those shown on the drawings to accommodate the installation of systems, this contractor (Division 28) shall include such provisions in this contract. Provide conduit suitable for its application and sized in accordance with industry standards. Include nylon bushings at conduit ends and firestopping as required around conduits wherever building barriers are penetrated. If necessary, this contractor shall hire a qualified contractor to perform this work.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

A. City of Reedsport shall not be responsible for delays in work because of shutdowns due to unsafe working practices by Contractors.

B. Contractor shall clean work areas each day and remove debris properly and legally from the property. Materials and supplies stored for use in the project shall be neatly stacked outside the circulation areas. All exits and paths shall be cleaned so as to prevent dirt from being tracked into the facilities.

C. Contractor shall ensure that all building fixtures have been re-installed to their original condition at the conclusion of the final shift of the day.

D. It shall be the responsibility of the Contractor to secure any parking permits prior to the first day of work on-site.

E. Work outside of normal operating hours and days shall be coordinated with City of Reedsport.

3.02 FINAL CLEANING

A. Division 28 Contractor shall thoroughly clean all enclosures, assemblies and field devices before they are turned over to City of Reedsport for operation. Should the special system's room(s) be completed prior to the balance of the floor space construction that it serves, racks, cabinets, and wall frames shall be covered with plastic sheeting to repel dust and other contaminants to which they will be subjected.

3.03 SAFETY REQUIREMENTS

A. All contract work shall be performed in accordance with the policies, procedures, and standards established by the City of Reedsport.

B. In construction areas, all Contractor personnel shall wear personnel protection devices, as deemed appropriate by the General Contractor and as required by OSHA for the work location and work operation being performed. Devices shall include, but not be limited to hardhats, work boots, safety eye protection, reflective vests, etc.

C. All exposed holes, pits, pipes, etc., either inside or outside the project facilities, shall be barricaded or plated and adequately secured when Contractor personnel are not present. All ladders, hanging wires, pipes, and other items protruding at a pedestrian level travel way most be removed or secured following the final shift of the day.

D. During breaks or when only a portion of work has been completed, tools shall not be left exposed where others may risk injury or attempt to use them. Windows and doors shall not be left unsecured or propped open during breaks. At the completion of the final shift each day, doors, windows, or other openings shall be adequately secured.

E. When driving on property, Contractor personnel shall observe all traffic safety regulations and pay particular attention to pedestrians. All loose material and debris on vehicles shall be adequately secured and tied down.

END OF SECTION 28 0000

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SECTION 28 0505
SELECTIVE DEMOLITION OF ELECTRONIC SAFETY AND SECURITY SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition, temporary removal, relocation, or reconfiguration of selected site elements and/or Information Technology (IT), Security or other Special Systems or infrastructure.
   3. Salvage of existing items to be reused or recycled.

B. Contractor shall include in the Bid all labor, materials, tools, transportation, storage costs, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete demolition and cutover of existing telecommunication systems shown and described in the drawings and specifications herein.

C. The Contractor is responsible for providing and coordinating phased activities and construction methods that minimize disruption to operations and provide complete and operational systems. Equipment and devices shall not be removed or reconfigured until removal or reconfiguration has been coordinated with owner and approval is given in writing.

D. The Contractor shall coordinate interfaces to existing systems that are being demolished in order to minimize disruption to the existing systems operations. Any systems outages shall be approved in advance and scheduled with City of Reedsport.

1.02 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. The following documents shall also be considered as a part of and shall relate directly to this section:
   1. Section 28 0000 - GENERAL REQUIREMENTS FOR ELECTRONIC SAFETY & SECURITY SYSTEMS

1.03 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Field verify the existing conditions, device equipment locations to determine the extent of the demolition required. Notify the Design Team of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify the Design Team. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.04 DEFINITIONS

A. Reference section 28 0000 - GENERAL REQUIREMENTS FOR ELECTRONIC SAFETY & SECURITY SYSTEMS

1.05 QUALITY ASSURANCE

A. Comply quality assurance requirements listed in section 28 0000 - GENERAL REQUIREMENTS FOR ELECTRONIC SAFETY & SECURITY SYSTEMS

1.06 CODES AND STANDARDS

A. Comply with codes and standards listed in section 28 0000 - GENERAL REQUIREMENTS FOR ELECTRONIC SAFETY & SECURITY SYSTEMS

1.07 ADMINISTRATIVE REQUIREMENTS

A. Pre-Demolition Meeting
   1. Conduct a pre-demolition meeting at Project Site with City of Reedsport and all affected stakeholders.
      a. Inspect and discuss condition of construction to be selectively demolished.
      b. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Existing telecommunications rooms that have demolition work may involve electrical, mechanical and architectural demolition. Review and coordinate requirements of work performed by other trades.
      d. Review areas where existing construction is to remain and requires protection.
      e. Review procedures to be followed when critical systems are inadvertently interrupted. The Contractor shall be responsible for the coordination required with City of Reedsport prior to device removal to ensure systems that must remain operational are not compromised during the demolition process.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL - SELECTIVE DEMOLITION

A. Demolition and construction methods shall conform to City of Reedsport requirements, requirements of the State of Iowa and all applicable building codes.

B. 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. Complete selective demolition operations above each floor or tier, before disturbing supporting members on the next lower level, if applicable. Remove all abandoned cable from origin to destination.
   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. 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/or portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

C. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's designated storage area. Coordinate delivery of equipment with City of Reedsport seven (7) days prior to delivery.
   5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
   5. Perform testing on reinstalled active systems and get sign-off by the Owner or Owner's representative inspector that systems are re-connected and working properly.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.02 EXAMINATION

A. Verify that utilities have been disconnected and capped per approved procedures before starting selective demolition operations.

B. Survey existing condition of all communications systems related conduits and cables from origin to destination and correlate with requirements indicated to determine extent of selective demolition required.

C. Label all conduits and cables with origin, destination and what system they serve.

D. Consult with the Owner to determine whether systems can be disabled or whether a new parallel system needs to be installed.

E. When unanticipated mechanical, electrical, or structural 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 the Design Team.

3.03 UTILITY SERVICES AND COMMUNICATION SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions.
   2. For existing equipment with active components in them, provide dust protection and circulate cooling air with a portable air conditioning unit or other means to ensure equipment does not overheat.

B. Existing Services/Systems to Be Removed, or Relocated: Locate, identify, disconnect, and seal or cap off indicated utility services and communications systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor. Coordinate the disconnection of all electrical circuits with the Electrical Contractor prior to disconnection.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.04 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.
   1. Comply with requirements for access and protection.

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 and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling.

3.05 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 onsite.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

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

3.06 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.

B. The contractor shall be required, on a daily basis, to dispose of any demolished material not required to be returned to the Owner. All materials shall be transported off of the Owner’s property at the expense of the Contractor.

C. At the end of each workday or shift, the Contractor shall be required to clean-up the work area and remove all construction debris such that the site is clean and usable without hazard to workers.

END OF SECTION 28 0505

SECTION 28 2000
VIDEO MANAGEMENT SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Video surveillance system requirements.

B. Video recording and viewing equipment.

C. Cameras.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 27 1000 - STRUCTURED CABLING: Data cables for IP video surveillance system network connections.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices current edition.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 303 - Standard for Installing and Maintaining Closed-Circuit Television (CCTV) Systems 2019.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70.
   2. Applicable TIA/EIA standards.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Video Recording and Viewing Equipment - Basis of Design: Lorex.

2.02 VIDEO SURVEILLANCE SYSTEM

A. Provide modifications and extensions to existing video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories,

software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.
   1. Video Storage Capacity: Existing 16-Channel Lorex Network Video Recorder to be replaced with a new 32-channel model..

C. Cameras Required:
   1. See article "CAMERAS" below for product descriptions.

D. Video Recording and Viewing Equipment Required:
   1. See article "VIDEO RECORDING AND VIEWING EQUIPMENT" below for product descriptions.

E. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with video surveillance system.

F. Provide products listed, classified, and labeled as suitable for the purpose intended.

G. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.03 VIDEO RECORDING AND VIEWING EQUIPMENT

A. Provide video recording and viewing equipment compatible with cameras to be connected.

B. Network Video Recorders (NVRs):
   1. Supports connection of network (IP) cameras.
   2. Supports continuous and event-based recording.
   3. Network Video Recorder:
      a. Basis of Design: Lorex 4K Ultra HD Network Video Recorder.
      b. Capacity: 32 channels.

C. Software:
   1. Unless otherwise indicated, provide all software and licenses required for fully operational system.

2.04 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:
   1. Signal-to-Noise Ratio: Not less than 50 dB.
   2. Provide the following standard features:
      a. Automatic electronic shutter.
      b. Automatic gain control.
      c. Automatic white balance.
      d. Web-based interface for remote viewing and setup.
      e. Password protected security access.

D. Camera Enclosures and Mounting Brackets:
   1. Where not factory-installed, provide accessory camera enclosures suitable for operation under the service conditions at the installed location.
   2. Where not factory-installed, provide accessory camera mounting brackets necessary for installation.

E. Refer to the Drawings for locations and types of cameras required.

2.05 ACCESSORIES

A. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

B. Provide components as indicated or as required for system power and network connections.

C. Provide cables as indicated or as required for connections between system components.
   1. Data Cables for IP Network Connections: Unshielded twisted pair (UTP) complying with Section 27 1000.

D. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 0529.

D. Provide grounding and bonding in accordance with Section 26 0526.

E. Identify system wiring and components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

D. Program system parameters according to requirements of Owner.

E. Test for proper interface with other systems.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

END OF SECTION 28 2000

APPENDIX A

EXISTING CONDITIONS REPORT

HOLDOWN SCHEDULE

(Y)	SIMPSON MODEL	ALLOWABLE LOAD (lb)	POST THICKNESS	FASTENER	ANCHOR	REMARKS
1	HDU5-SDS2.5	5645	3"	(14) 1/4 x 2 1/2" SDS	5/8"	PL1/4x3x0'-3" w/ DBL NUT AT BOT OF THREADED ROD
2	HDU8-SDS2.5	7870	4 1/2"	(20) 1/4 x 2 1/2" SDS	7/8"	PL1/4x4x0'-4" w/ DBL NUT AT BOT OF THREADED ROD

1. NAILS ARE TO BE COMMON WIRE NAILS, U.N.O.
2. HARDWARE IS TO BE SIMPSON, U.N.O.
3. HOLDOWN HARDWARE CAN BE EXTENDED WITH A307 THREADED ROD AND COUPLER.
4. ALIGN ALL HOLDOWNS FOR THE FULL HEIGHT OF STRUCTURE.
5. ALL HARDWARE TO BE INSTALLED PER MANUFACTURE'S SPECIFICATIONS.
6. HOLDOWN ANCHOR BOLTS ARE IN ADDITION TO TYPICAL SILL PLATE ANCHOR BOLTS.
7. EXTEND THREADED ROD TO WITHIN 3" CLEAR OF BOTTOM OF FOOTING.

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SHEAR WALL SCHEDULE

(X)	SHEATHING	NAIL SIZE	EDGE NAILING (o.c.)	FIELD NAILING (o.c.)	PANEL EDGE STUDS	TOP PLATE A35 (o.c.)	BOTTOM PLATE DIMENSION	BOTTOM PLATE FASTENING (o.c.)	SILL PLATE ANCHORAGE (o.c.)	REMARKS
A	7/16" APA RATED	10d	6"	12"	2x	2'-0"	2x	16d @ 6"	5/8" DIA. A.B. @ 4'-0"	
B	7/16" APA RATED	10d	4"	12"	4x OR (2) 2x	1'-6"	2x	16d @ 6"	5/8" DIA. A.B. @ 3'-0"	
C	7/16" APA RATED	10d	3"	12"	4x OR (2) 2x	1'-0"	3x	16d @ 4"	5/8" DIA. A.B. @ 2'-0"	

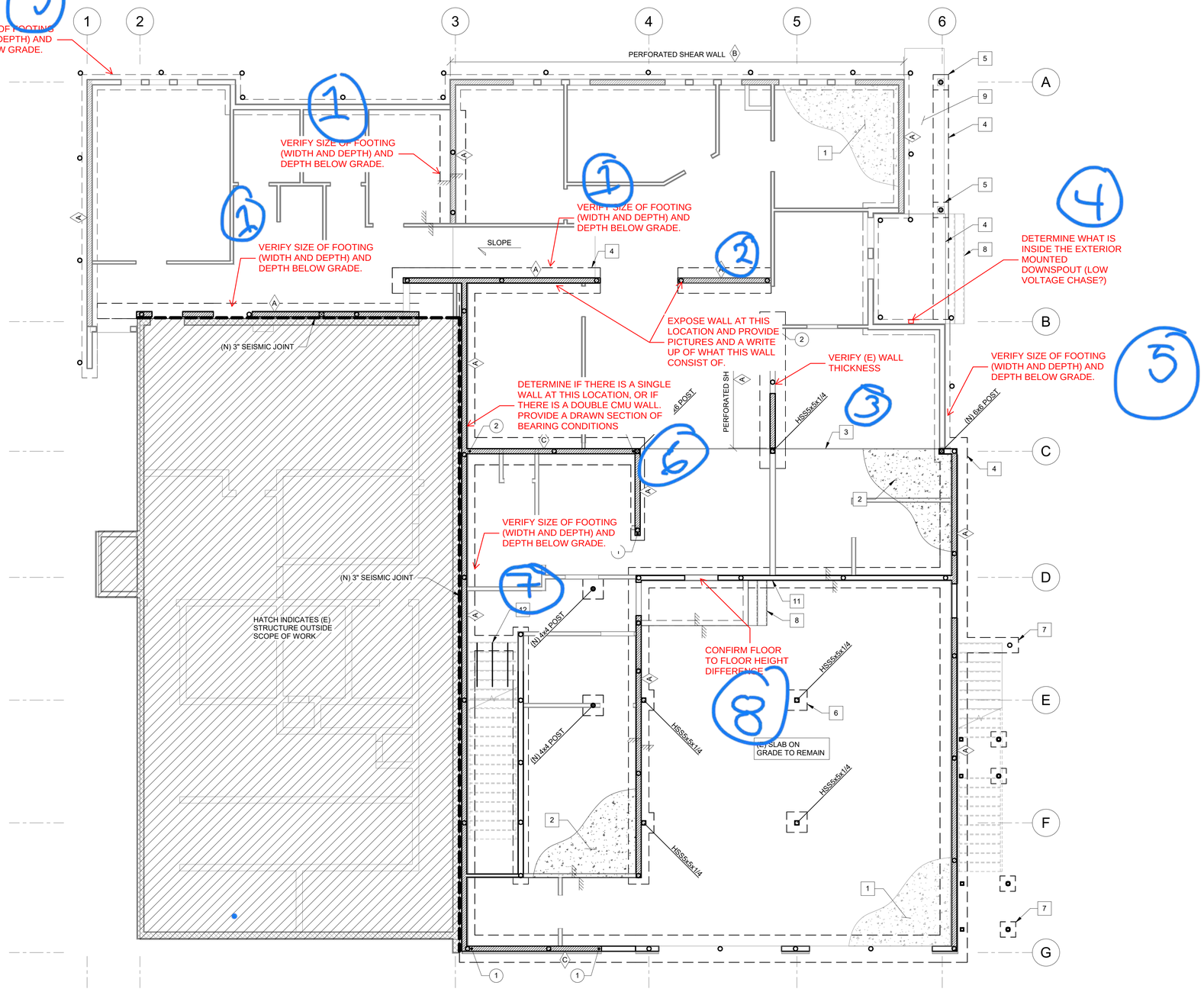
1. ALL PLYWOOD TO BE APA RATED STRUCTURAL 1 EXTERIOR SHEATHING
2. ALL NAILS TO BE COMMON OR GALVANIZED BOX TYPE.
3. ATTACH RIM JOIST AND / OR BLOCKING TO SHEAR WALL AS INDICATED IN TABLE ABOVE.
4. ALL WALL SHEATHING TO EXTEND FULL HEIGHT OF WALL, TOP PLATE TO BOTTOM PLATE.
5. ALL SHEAR WALLS AND HOLDOWNS MUST HAVE CONTINUOUS LOAD PATH TO FOUNDATION.
6. USE PL1/4x3x0'-3" WASHER TYPICAL AT ALL ANCHOR BOLTS.
7. WHERE TOP PLATE FASTENING IS LESS THAN 12" o.c., USE MINIMUM BLOCKING OF 2-1/2" MANUFACTURED LUMBER (MICROLLAM LVL, OR PARALLAM PSL).
8. ALL SHEAR WALLS TO BE FULLY BLOCKED U.N.O. BLOCKING TO MATCH REQUIREMENTS FOR PANEL EDGE STUDS.
9. FOR SHEAR WALLS w/ (2) ROWS OF BOTTOM PLATE NAILING, USE MIN. 1-3/4" RIM BOARD, SPACE ROWS A MIN. OF 1/2" APART, AND STAGGER NAILS.

DESTRUCTIVE INVESTIGATIONS NOTES:

1. PICTURES AND DESCRIPTIONS ARE TO BE PROVIDED AT EACH LOCATION EXPLORED.

2. PROVIDE WEATHER PROOFING AT LOCATIONS WHERE ROOF OR EXTERIOR WALLS ARE PENETRATED.

3. DEMO LOCATIONS MUST BE COORDINATED WITH FIRE DEPARTMENT AND PROVIDE PATCHING WHERE IS REQUIRED FOR FIRE STATION TO FUNCTION PROPERLY.



1 S1.1 FOUNDATION PLAN
3/16" = 1'-0"

FOUNDATION AND FRAMING PLAN NOTES:

1. DIMENSIONS SHOWN ARE FOR REFERENCE ONLY, CONFIRM w/ ARCHITECTURAL PLAN & DETAILS.
2. BOTTOM OF FOOTINGS TO BE PLACED BELOW FROST DEPTH OR AS NOTED IN THE GEOTECHNICAL REPORT, WHICHEVER IS GREATER.
3. COORDINATE PENETRATIONS OF SITE UTILITIES, MECHANICAL DUCTS, PIPING, AND ELECTRICAL CONDUIT/PANELS TO MINIMIZE IMPACT TO STRUCTURAL FRAMING. PLUMBING FIXTURES SHOWN ON FLOOR FOR REFERENCE AND POSSIBLE FRAMING CONFLICTS ONLY.
4. ALL FOOTINGS ARE TO BE CENTERED UNDER COLUMNS U.N.O.
5. ALL FOOTINGS TO BEAR OVER GRADE OVER FIRM, UNDISTURBED, NON-ORGANIC, NON-EXPANSIVE NATIVE MATERIAL, OR STRUCTURAL FILL AS REQUIRED PER GEOTECHNICAL REPORT.
6. SEE SHEET S0.1 FOR ALL NOTES AND SCHEDULES.
7. INDICATES FLOOR STEP REF. ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.
8. INDICATES APPROXIMATE LOCATION OF MICROPILE TO BE DESIGNED BY OTHERS.
9. (X) INDICATES SHEAR WALL TYPE. SEE SHEAR WALL SCHEDULE FOR ADDITIONAL INFORMATION.
10. INDICATES SHEAR WALL LOCATION ABOVE FOUNDATION. SEE SHEAR WALL SCHEDULE FOR ADDITIONAL INFORMATION.
11. (Y) INDICATES HOLDOWN TYPE AND LOCATION. SEE HOLDOWN SCHEDULE FOR ADDITIONAL INFORMATION.
12. X'-X" INDICATES TOP OF SLAB ELEVATION. COORDINATE WITH ARCHITECT.
13. F-XX (XXX'-X") INDICATES FOOTING TYPE PER FOUNDATION SCHEDULE AND TOP OF FOOTING ELEVATION.
14. INDICATES (E) WOOD WALL TO RECEIVE (N) WALL SHEATHING PER SHEAR WALL SCHEDULE.
15. INDICATES (E) WOOD WALL TO REMAIN.
16. INDICATES (N) 2x6 @ 16" o.c. BEARING WALL.
17. INDICATES (E) CMU WALL TO REMAIN.

FOUNDATION PLAN KEYNOTE LEGEND: X

1. (E) CONCRETE SLAB.
2. (N) 4" CONCRETE SLAB w/ #4 @ 18" o.c. EACH WAY.
3. INDICATES OUTLINE OF (N) SLAB. EPOXY SLAB REINFORCEMENT 4" MIN EMBED INTO (E) SLAB.
4. (N) GRADE BEAM.
5. (N) FOOTING AND MICROPILE AT (E) COLUMN.
6. (N) FOOTING AND MICROPILE AT (N) HSS COLUMN.
7. (N) FOOTING AND MICROPILE AT STAIRS.
8. (N) CONCRETE STAIR.
9. (N) CONCRETE RAMP.
10. (N) PREFABRICATED STEEL STAIRS BY OTHERS.
11. (N) 6" CONCRETE WALL.
12. (N) 1 3/4" x 14" STAIR STRINGERS @ 12" o.c.

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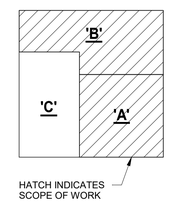
REEDSPORT FIRE DISTRICT
124 N 4TH ST.
REEDSPORT, OR 97467

REEDSPORT FIRE STATION 7

PRELIMINARY- NOT FOR CONSTRUCTION

KEY PLAN



△	DATE:	Description

PROJECT NO.	G-1468-21
DRAWN:	PWR
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DATE:	06-23-2022

FOUNDATION PLAN

S1.1

50% DD SET / NOT FOR CONSTRUCTION

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DESTRUCTIVE INVESTIGATIONS NOTES:

1. PICTURES AND DESCRIPTIONS ARE TO BE PROVIDED AT EACH LOCATION EXPLORED.

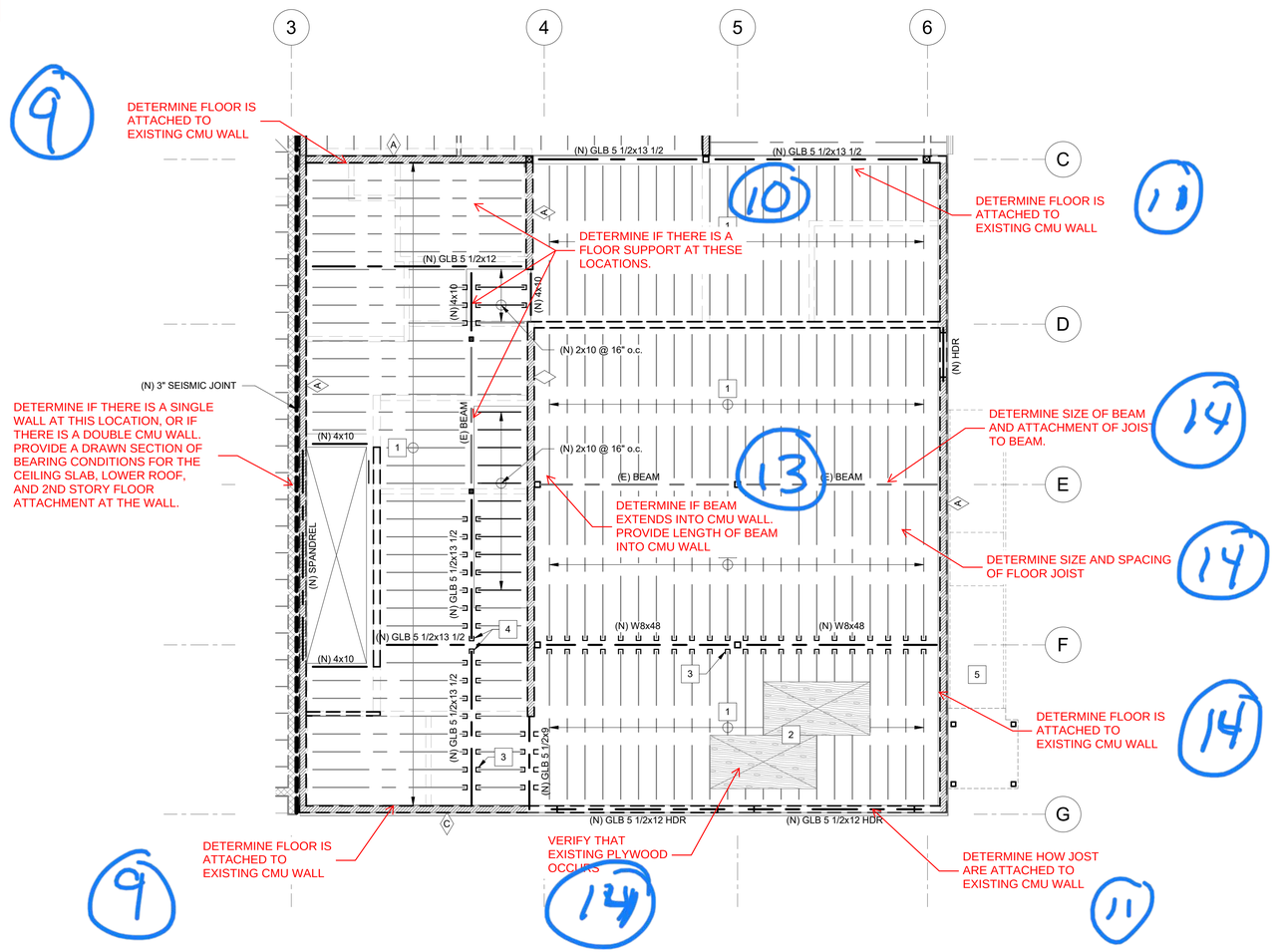
2. PROVIDE WEATHER PROOFING AT LOCATIONS WHERE ROOF OR EXTERIOR WALLS ARE PENETRATED.

3. DEMO LOCATIONS MUST BE COORDINATED WITH FIRE DEPARTMENT AND PROVIDE PATCHING WHERE IS REQUIRED FOR FIRE STATION TO FUNCTION PROPERLY.

SHEAR WALL SCHEDULE

X	SHEATHING	NAIL SIZE	EDGE NAILING (o.c.)	FIELD NAILING (o.c.)	PANEL EDGE STUDS	TOP PLATE A35 (o.c.)	BOTTOM PLATE DIMENSION	BOTTOM PLATE FASTENING (o.c.)	SILL PLATE ANCHORAGE (o.c.)	REMARKS
A	7/16" APA RATED	10d	6"	12"	2x	2'-0"	2x	16d @ 6"	5/8" DIA. A.B. @ 4'-0"	
B	7/16" APA RATED	10d	4"	12"	4x OR (2) 2x	1'-6"	2x	16d @ 6"	5/8" DIA. A.B. @ 3'-0"	
C	7/16" APA RATED	10d	3"	12"	4x OR (2) 2x	1'-0"	3x	16d @ 4"	5/8" DIA. A.B. @ 2'-0"	

1. ALL PLYWOOD TO BE APA RATED STRUCTURAL 1 EXTERIOR SHEATHING
2. ALL NAILS TO BE COMMON OR GALVANIZED BOX TYPE.
3. ATTACH RIM JOIST AND / OR BLOCKING TO SHEAR WALL AS INDICATED IN TABLE ABOVE.
4. ALL WALL SHEATHING TO EXTEND FULL HEIGHT OF WALL, TOP PLATE TO BOTTOM PLATE.
5. ALL SHEAR WALLS AND HOLDOWNS MUST HAVE CONTINUOUS LOAD PATH TO FOUNDATION.
6. USE PL1/4x3x0'-3" WASHER TYPICAL AT ALL ANCHOR BOLTS.
7. WHERE TOP PLATE FASTENING IS LESS THAN 12" o.c., USE MINIMUM BLOCKING OF 2-1/2" MANUFACTURED LUMBER (MICROLLAM LVL, OR PARALLAM PSL).
8. ALL SHEAR WALLS TO BE FULLY BLOCKED U.N.O. BLOCKING TO MATCH REQUIREMENTS FOR PANEL EDGE STUDS.
9. FOR SHEAR WALLS w/ (2) ROWS OF BOTTOM PLATE NAILING, USE MIN. 1-3/4" RIM BOARD, SPACE ROWS A MIN. OF 1/2" APART, AND STAGGER NAILS.



1 S2.1 SECOND FLOOR FRAMING PLAN
3/16" = 1'-0"

FLOOR FRAMING PLAN NOTES:

1. COORDINATE ALL DIMENSIONS & FEATURES NOT SHOWN WITH ARCHITECT.
2. SEE SHEET S0.1 FOR ALL NOTES AND SCHEDULES.
3. BEAMS ARE CENTERED ON COLUMNS, WALLS, AND/OR GRID LINES, U.N.O.
4. SEE X/SX.X FOR TYPICAL STEEL BEAM CONNECTIONS.
5. INDICATES SHEAR WALL TYPE. SEE SHEAR WALL SCHEDULE FOR ADDITIONAL INFORMATION.
6. INDICATES SHEAR WALL LOCATION BELOW FRAMING. SEE SHEAR WALL SCHEDULE FOR ADDITIONAL INFORMATION.
7. ALL SHEAR WALLS INDICATED AS "PERFORATED" THE CONTRACTOR SHALL PROVIDE NAILING PATTERN AROUND ALL WALL PENETRATIONS AS CALLED OUT ON FRAMING PLANS IN CORRESPONDENCE WITH THE SHEAR WALL SCHEDULE.
8. INDICATES HOLDOWN TYPE AND LOCATION. SEE HOLDOWN SCHEDULE FOR ADDITIONAL INFORMATION.
9. INDICATES (E) WOOD WALL TO RECEIVE (N) WALL SHEATHING PER SHEAR WALL SCHEDULE.
10. INDICATES (E) WOOD WALL TO REMAIN.
11. INDICATES (N) 2x6 @ 16" o.c. BEARING WALL.
12. INDICATES (E) CMU WALL TO REMAIN.

FLOOR FRAMING KEYNOTE LEGEND:

1. (E) FLOOR FRAMING TO REMAIN.
2. (E) FLOOR SHEATHING TO BE RENAILED w/ 10d NAILS @ 6" o.c. AT PANEL EDGES AND 12" o.c. AT FIELD CONDITIONS.
3. (N) SIMPSON LUS210 FACEMOUNT HANGERS.
4. (N) SIMPSON HGUS5.5/10.
5. (N) PREFABRICATED STEEL STAIRS BY OTHERS.

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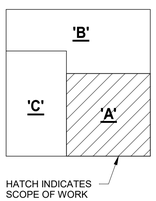
REEDSPORT FIRE DISTRICT
124 N 4TH ST.
REEDSPORT, OR 97467

REEDSPORT FIRE STATION 7

REEDSPORT FIRE DEPT. VOLUNTEER

PRELIMINARY- NOT FOR CONSTRUCTION

KEY PLAN



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CHECKED:	MRS
DATE:	06-23-2022

FLOOR FRAMING PLAN

S2.1

50% DD SET / NOT FOR CONSTRUCTION

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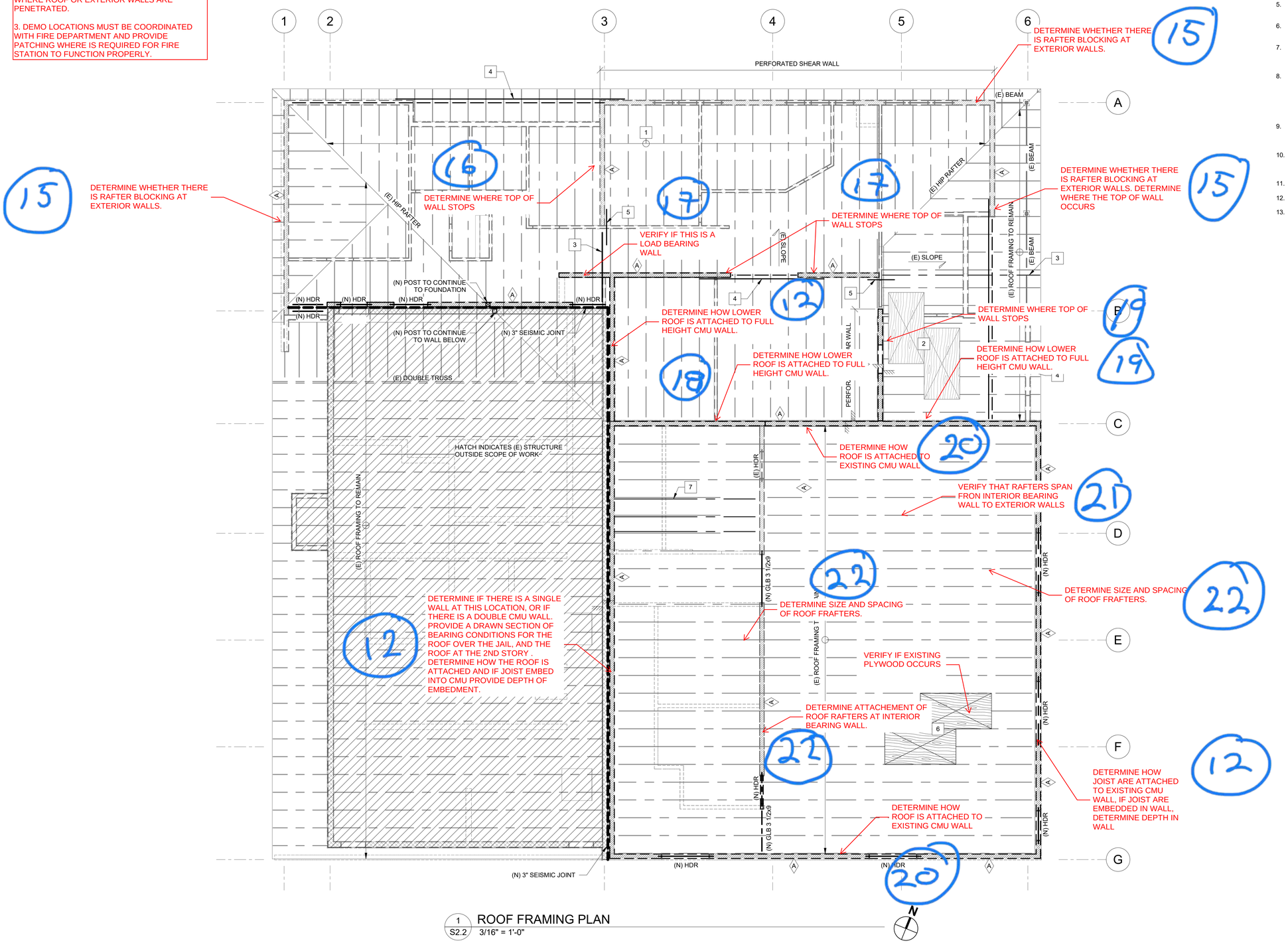
DESTRUCTIVE INVESTIGATIONS NOTES:

1. PICTURES AND DESCRIPTIONS ARE TO BE PROVIDED AT EACH LOCATION EXPLORED.

2. PROVIDE WEATHER PROOFING AT LOCATIONS WHERE ROOF OR EXTERIOR WALLS ARE PENETRATED.

3. DEMO LOCATIONS MUST BE COORDINATED WITH FIRE DEPARTMENT AND PROVIDE PATCHING WHERE IS REQUIRED FOR FIRE STATION TO FUNCTION PROPERLY.



1 ROOF FRAMING PLAN
S2.2 3/16" = 1'-0"

ROOF FRAMING PLAN NOTES:

1. COORDINATE ALL DIMENSIONS & FEATURES NOT SHOWN WITH ARCHITECT.
2. SEE SHEET S0.1 FOR ALL NOTES AND SCHEDULES.
3. TRUSS LAYOUT IS FOR REFERENCE ONLY. CONFIRM LAYOUT & BEARING CONDITIONS WITH TRUSS SUPPLIER'S LAYOUT PLAN.
4. INDICATES ROOF STEP, TYP. SEE ARCHITECTURAL PLANS FOR MORE INFORMATION.
5. BEAMS ARE CENTERED ON COLUMNS, WALLS, AND/OR GRID LINES, U.N.O.
6. SEE X/S X.X FOR TYPICAL STEEL BEAM CONNECTIONS.
7. INDICATES SHEAR WALL LOCATION BELOW FRAMING. SEE SHEAR WALL SCHEDULE FOR ADDITIONAL INFORMATION.
8. ALL SHEAR WALLS INDICATED AS "PERFORATED" THE CONTRACTOR SHALL PROVIDE NAILING PATTERN AROUND ALL WALL PENETRATIONS AS CALLED OUT ON FRAMING PLANS IN CORRESPONDENCE WITH THE SHEAR WALL SCHEDULE.
9. INDICATES HOLDOWN TYPE AND LOCATION. SEE HOLDOWN SCHEDULE FOR ADDITIONAL INFORMATION.
10. INDICATES (E) WOOD WALL TO RECEIVE (N) WALL SHEATHING PER SHEAR WALL SCHEDULE.
11. INDICATES (E) WOOD WALL TO REMAIN.
12. INDICATES (N) 2x6 @ 16" O.C. BEARING WALL.
13. INDICATES (E) CMU WALL TO REMAIN.

ROOF FRAMING KEYNOTE LEGEND:

1. (E) ROOF FRAMING TO REMAIN.
2. (E) ROOF SHEATHING TO BE RENAILED w/ 10d NAILS @ 6" o.c. AT PANEL EDGES AND 12" o.c. AT FIELD CONDITIONS.
3. (N) 4x6 ALIGNED AT SHEAR WALL.
4. (N) 4x BLOCKING AND SIMPSON XXX STRAP.
5. (N) SIMPSON STRAP.
6. (N) 5/8" APA RATED ROOF SHEATHING LAID PERPENDICULAR TO 2x RAFTERS AND ATTACHED DIRECTLY TO RAFTERS w/ 10d NAILS @ 6" o.c. AT BOUNDARY EDGES AND 12" o.c. AT FIELD CONDITIONS.
7. (N) 1 1/2" x 9 1/4" LVL SISTERED TO (E) RAFTER w/ (2) ROWS OF 16d NAILS STAGGERED @ 12" o.c. AT HOSE TOWER OPENING.

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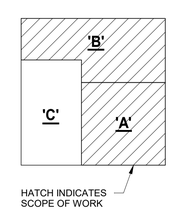
REEDSPORT FIRE DISTRICT
124 N 4TH ST.
REEDSPORT, OR 97467

REEDSPORT FIRE STATION 7

KEY PLAN



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	DATE:	Description

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ROOF FRAMING PLAN

S2.2

50% DD SET / NOT FOR CONSTRUCTION

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DESTRUCTIVE INVESTIGATION RESULTS. THE FOLLOWING DESCRIPTIONS AND PICTURES CORRESPOND TO THE 'BLUE' CIRCLED NUMBERS ON THE PRECEDING FLOOR PLANS.

1. Interior FTG's are 3' wide x 1'6" deep - typical.
2. 8" CMU walls
3. 10 1/4" wall
4. Exterior mounted downspout is used as low voltage chase.
5. Exterior FTG's on new side of building are monolithic - 3' wide x 1'6" deep
6. Single 8" wide CMU
7. Old section of building has monolithic FTG that extends 12" past Exterior walls. In most places, 10" thick, rest of slab seems to be 6" to 8" thick.
8. Floor to floor height difference is 16".
9. Floor is not attached to side CMU wall, only bearing at end of joist.
10. West stair wall continues to 2nd floor and carries 2nd floor framing.
11. At end of joists, they are notched into CMU wall.
12. Single 8" CMU wall, 2nd floor joists are notched into CMU 4". Lower roof is attached to exterior pressure treated furring with 2x6 ledger. Upper roof joists sit 4" on top of CMU wall. (See Drawings)
13. Beam does not extend into CMU wall.
14. Joists land on beams and are toenailed with blocking. Between joists are 2x10 @ 16" O.C. Existing sheathing is 1/2' CDX with 1/4" underlayment on to.
15. Lower roof has block at all exterior walls and any interior walls.
16. Top of interior walls is @ 2nd floor joists.
17. Load bearing - top of wall is @ roof joists.
18. Lower roof is attached to CMU with 2x6 pressure treated ledger attached to 2x4 pressure treated furring.
19. Lower roof is attached to CMU @ this location with 3/8" wedge anchors # 4' O.C. Top of wall is 4'6" above 2nd floor deck.
20. Roof is not attached to CMU - end of joists bear on top of CMU wall with blocking between.
21. 2x14 rafters span full length - exterior CMU to Interior bearing wall.
22. Interior bearing wall to East CMU - 2x14 @ 16" O.C. Interior bearing wall to West CMU - 2x12 @ 16" O.C. To nailed to wall with blocking between.

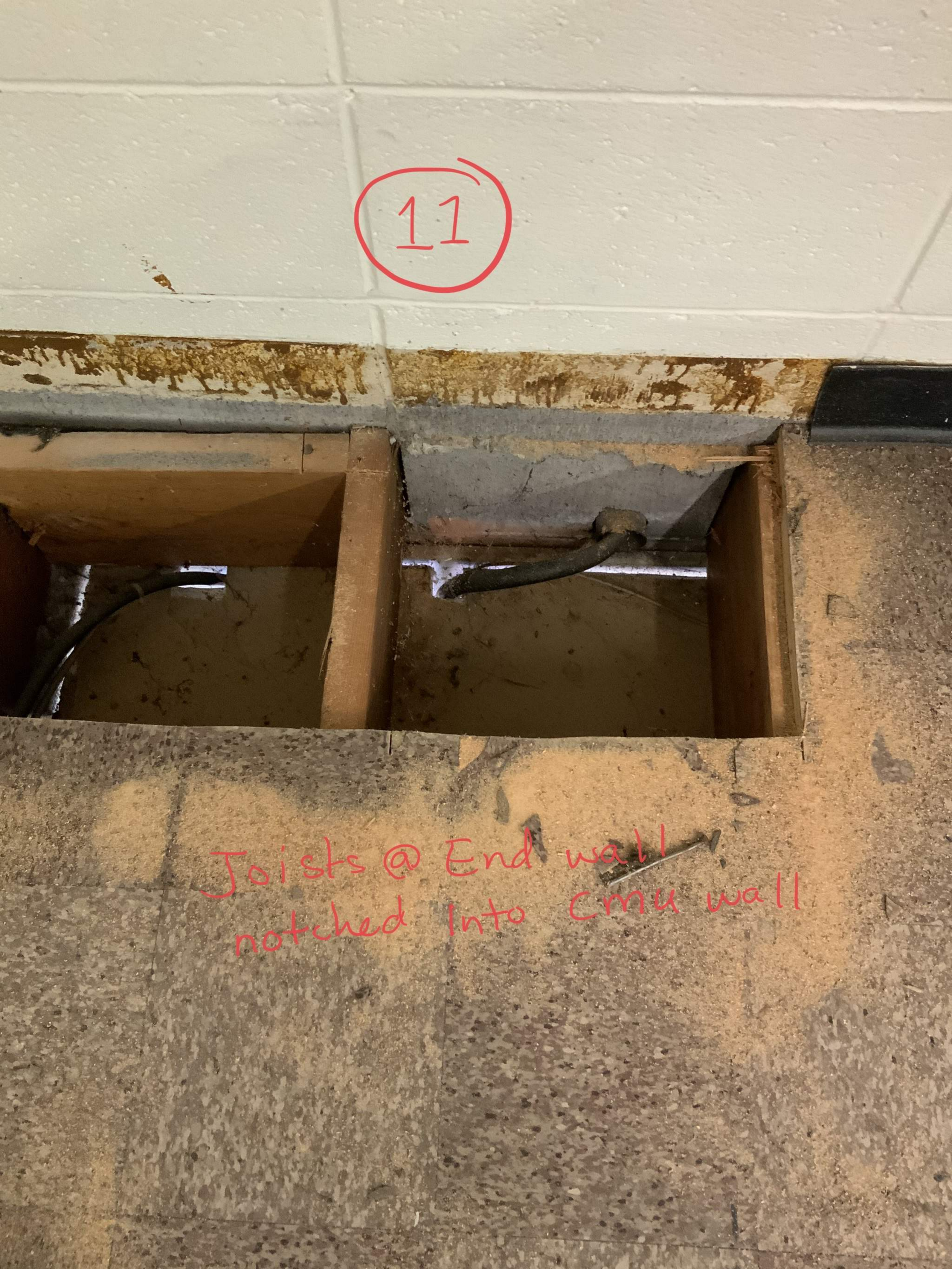

F

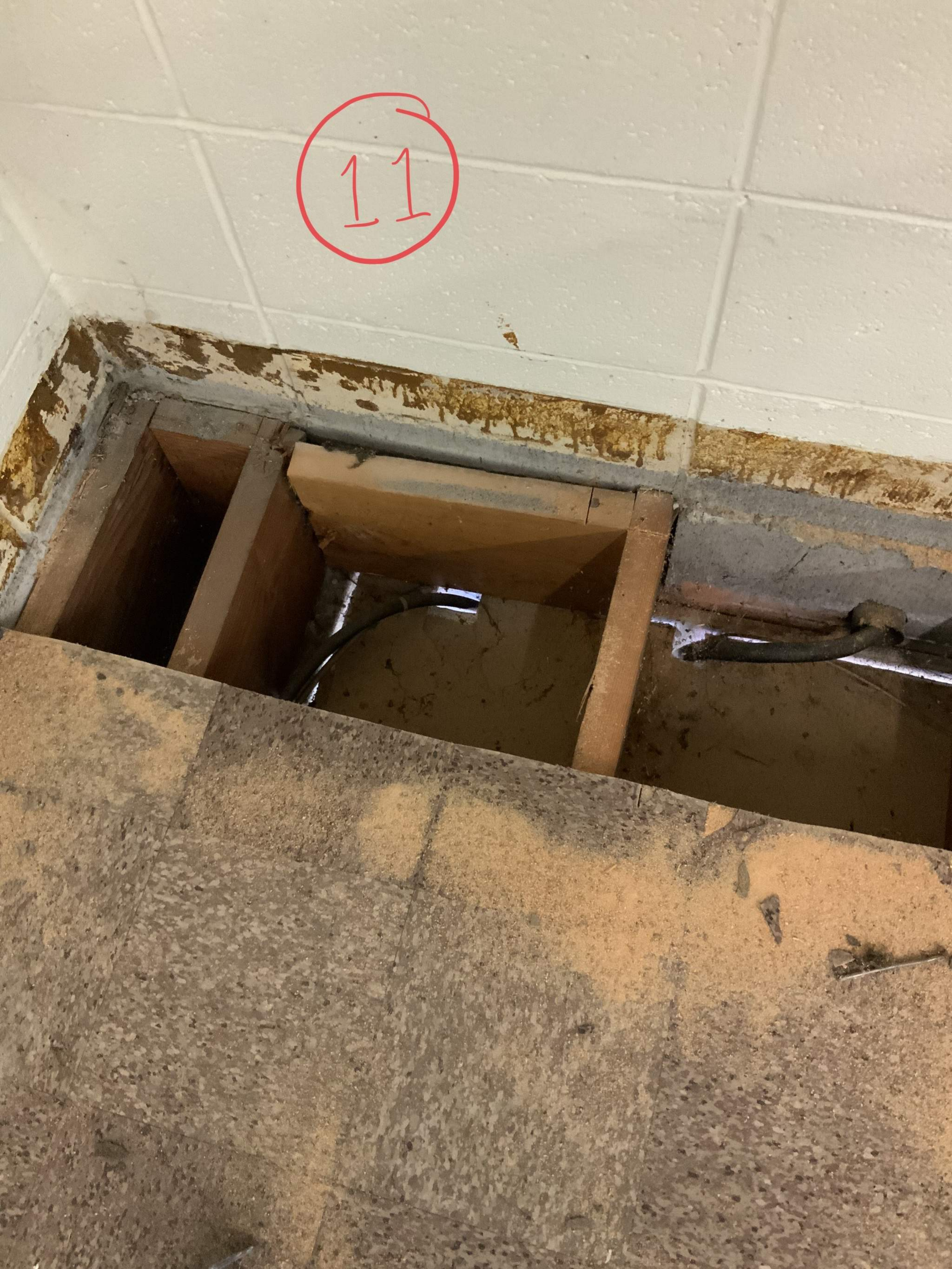
Downspout @ Entry way
is A Low voltage chase

4

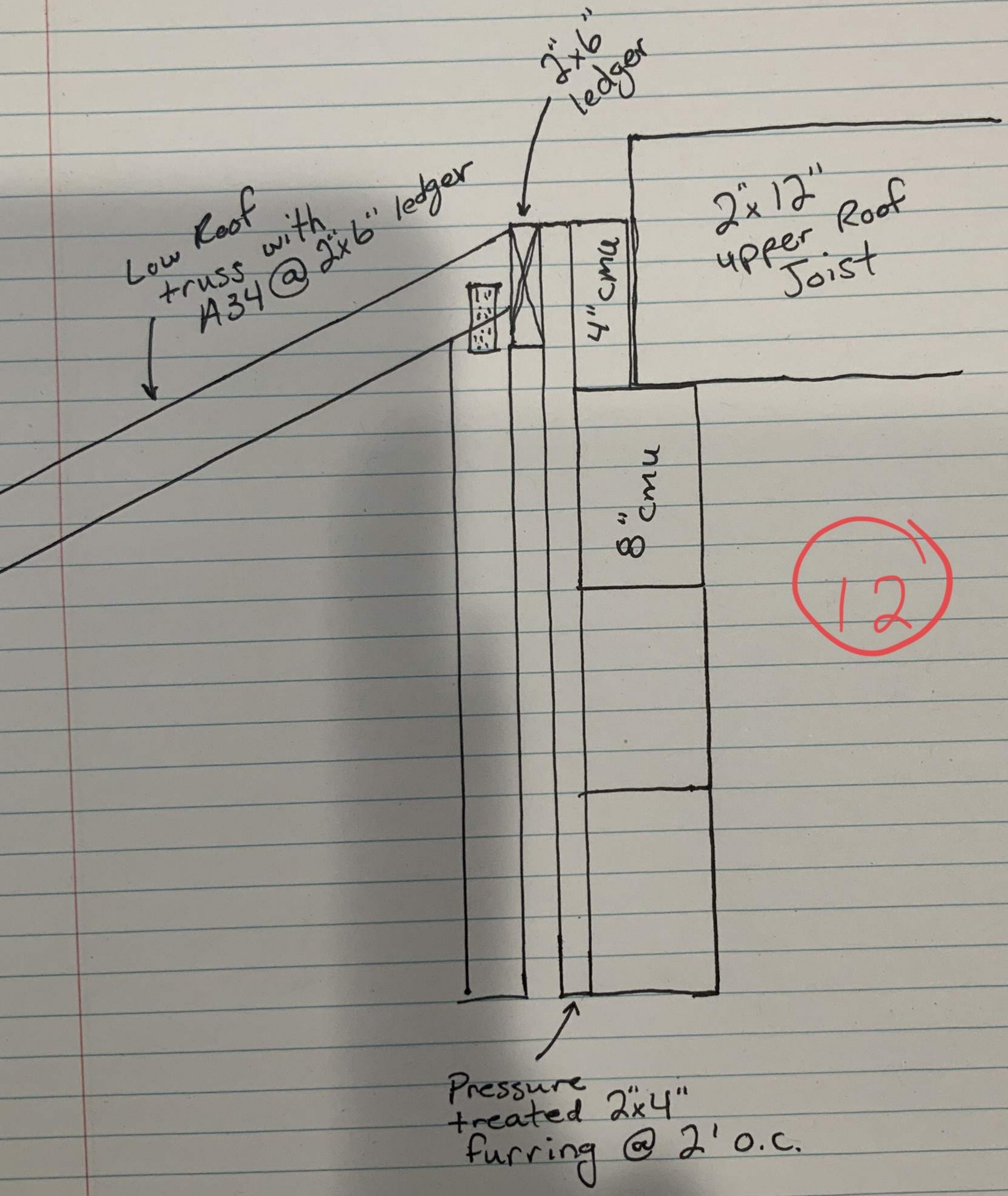

5


9


11
Joists @ End wall
notched into CMU wall


11

Low Roof Attachment to CMU walls
west




4" top
Block
8" single CMU
2x12 rafters @ 16 o.c.
going from west
cmu to Int. Bearing
wall @ stairs
12

12


12


12


13


13


14
Joists/ Beam @ Grid line E


14
Joists @ 16" o.c.
toe nailed to Beam


15

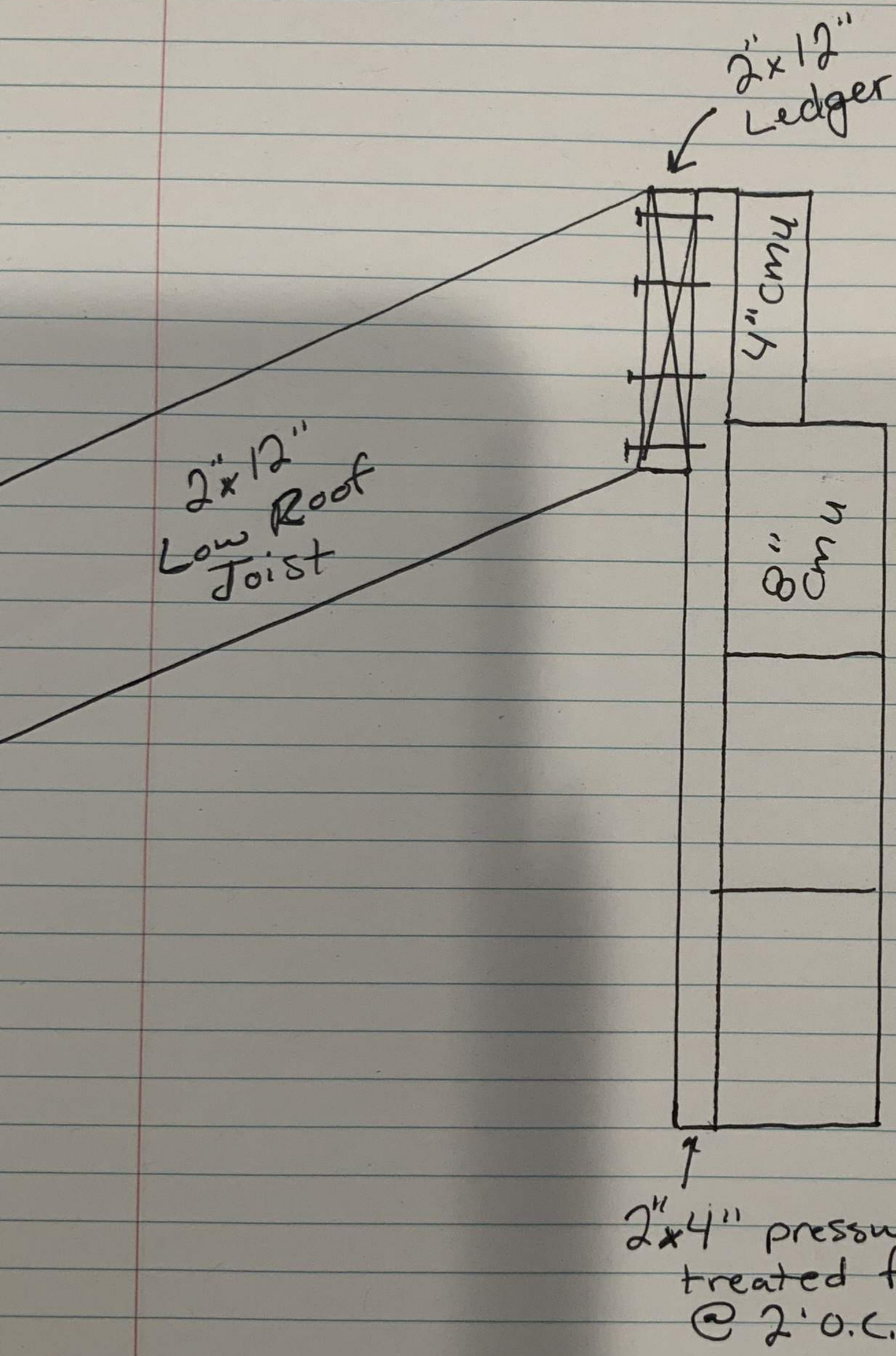

16/17


17


17'


17

Low Roof Attachment @ North CMU wall



18


19


18


22


2x14 rafters @
Int. Bearing wall
going to East
CMU wall
22


22


2x14
Rafters @
East
wall
22


Low
Roof
Attachment
@ west
wall over
Jail

APPENDIX B

GEOTECHNICAL REPORT

Geotechnical Investigation and Seismic Hazard Study

Station 7 Seismic Evaluation

Reedsport, Oregon

Prepared for:

ZCS Engineering & Architecture
Oregon City, Oregon

January 18,2023

Professional Geotechnical Services

Foundation Engineering, Inc.

Foundation Engineering, Inc.
Professional Geotechnical Services

Matthew Crawford
ZCS Engineering & Architecture
524 Main Street, Suite 2
Oregon City, Oregon 97045

January 18, 2023

Station 7 Seismic Evaluation
Geotechnical Investigation
and Seismic Hazard Study
Reedsport, Oregon

Project No.: 2221038

Dear Mr. Crawford:

We have completed the requested foundation investigation for the above-referenced project. Our report includes a description of our work, a discussion of site conditions, a summary of laboratory testing and a discussion of engineering analyses. Recommendations for the design and construction of the proposed underpinning of existing foundations are also enclosed.

A site-specific seismic hazard study was completed for the site to identify the potential geologic and seismic hazards and evaluate the effect those hazards may have on the project site. The study fulfills the requirements presented in the 2019 *Oregon Structural Specialty Code* (OSSC, 2019) for site-specific seismic hazard investigations for essential and hazardous facilities and major and special-occupancy structures. The 2019 *OSSC* is based on the 2018 *International Building Code (IBC)*. The local geology section and site-specific seismic hazard study were completed by Brooke Running, R.G., C.E.G.

There are numerous values in geotechnical investigations that are approximate, including measured lengths and soil layer depths and elevations. For brevity, the symbol "±" is used throughout this report to represent the words approximate or approximately when discussing approximate values.

It has been a pleasure assisting you with this phase of your project. Please do not hesitate to contact us if you have any questions or if you require further assistance.

Sincerely,

FOUNDATION ENGINEERING, INC.

Mallory L. McAdams, P.E.
Project Engineer

Melvin J. McCracken, P.E., G.E.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER 50451PE OREGON JUL. 14, 1998 MELVIN J. McCRACKEN
EXPIRES: 12/31/2024

MLM/MJM/lh
enclosure

GEOTECHNICAL INVESTIGATION AND SEISMIC HAZARD STUDY

STATION 7 SEISMIC EVALUATION
REEDSPORT, OREGON

BACKGROUND

The City of Reedsport (City) plans to complete a seismic retrofit of the existing Station 7 located at 146 N 4th Street in Reedsport, Oregon. The site location is shown on Figure 1A (Appendix A). The existing structure is a wood-frame building with a slab-on-grade floor. The structure includes single-story and two-story segments. The southwest portion of the structure is outside the limits of the currently proposed improvements. The existing structure and limits of the current work are shown on the Site Plan (Figure 2A, Appendix A).

We understand the existing structure will be evaluated in accordance with ASCE 41-17 design criteria. The purpose of the rehabilitation is to update the structure to meet the ASCE 41-17 requirements for the Basic Performance Objective for Existing Buildings (BPOE). Preliminary design drawings indicate the seismic rehabilitation includes retrofitting the existing shallow foundations by construction of micropile underpinning elements at regular intervals. We understand some new, micropile-supported foundations may also be required.

ZCS Engineering & Architecture (ZCS) is the architectural/structural consultant. Foundation Engineering, Inc. was retained by ZCS as the geotechnical consultant. Our scope of work was outlined in a proposal dated October 5, 2021, and authorized by a signed agreement dated December 10, 2021.

LOCAL GEOLOGY

Detailed discussions of the local and regional geology, tectonic setting, local faulting, historical seismicity, seismic hazards, and design earthquakes are included in the Site-Specific Hazard Study report (Appendix D). An abbreviated discussion of the local geology is provided below. References cited in this section are found in Appendix D.

The site is within the Oregon Coast Range, which is a north-south-trending range that includes the coastal areas to the west. Reedsport is located ±3 miles inland from the coast along the south bank of the Umpqua River and at the confluence with Smith River and Scholfield Creek. Station 7 is located within the east portion of Reedsport between the Umpqua River and a prominent ridge to the south.

Local geologic mapping indicates fill and estuarine deposits overlie alluvium at the site (Beaulieu and Hughes, 1975). The fill consists of loose sand, and the estuarine deposits consist of very soft to soft organic clayey silt. The alluvium consists of clay, silt, sand, and gravel associated with floodplains that drain the nearby elevated areas and deposits associated with the Umpqua River. The Flournoy Formation (middle Eocene, ±46 million years old) underlies the project site at a depth of ±77 feet (Beaulieu and Hughes, 1975).

FIELD EXPLORATION

We drilled one boring (BH-1) at the site on April 4, 2022, using a CME-75, truck-mounted drill rig with mud-rotary drilling methods. The boring was drilled in the parking lot on the west side of the existing building. The approximate boring location is shown on Figure 2A (Appendix A).

The boring was extended to a depth of ±80.3 feet. Samples were obtained at 2½-foot intervals to ±20 feet and at 5-foot intervals thereafter. Disturbed samples were obtained using a split-spoon sampler in conjunction with the Standard Penetration Test (SPT). The SPT provides an indication of the relative stiffness or density of the foundation soils. The number of blows required to drive the sampler the final 12 inches of an 18-inch long drive is recorded and represents the standard penetration resistance, or N-value, in blows per foot (bpf). Relatively undisturbed samples were obtained at selected depths by pushing thin-walled Shelby tubes.

The boring was continually logged during drilling. The final log (Appendix B) was prepared based on a review of the field logs, the laboratory test results, and an examination of the soil samples in our office.

DISCUSSION OF SITE CONDITIONS

Surface Conditions

The existing building is located at the northwest corner of the intersection of Winchester Avenue and N 4th Street. The station is surrounded by paved areas and a small, landscaped area to the south. The terrain in the area surrounding the building is relatively flat. Topographic information was not available at the time this report was prepared. However, Google earth and Lidar information suggests local ground elevations range from ±10 to 12 feet.

Subsurface Conditions

A general discussion of the soil units encountered in the boring is presented in the following sections. More detailed descriptions are summarized on the appended boring log (Appendix B).

Additional information regarding the boring logs and the definitions of symbols and descriptive terms used in the logs are provided on the *Important Information and Symbols* and the *Common Soil Descriptions Terms* sheets included in Appendix B. The sheets also include a discussion of the interpretation of the subsurface profiles at the boring locations and the inherent variations in the subsurface conditions across the site.

Boring BH-1 was drilled in the existing pavement southwest of the existing building. The drilling encountered a pavement section consisting of ±3 inches of asphaltic concrete (AC) over ±6 inches of dense crushed rock (base rock). The pavement is underlain by loose dredge sand (fill) with some silt to a depth of ±7.5 feet.

Estuarine deposits consisting predominantly of organic clayey silt underlies the dredge sand to a depth of ±20.5 feet. SPT N-value in this stratum ranged from 0 to 1 bpf (i.e., very soft). However, field vane shear tests completed on Shelby tube samples indicate the soil has an undrained shear strength of ±0.15 to 0.2 tons/ft^2 (tsf) suggesting a soft consistency. Strength values obtained by a field vane are typically more reliable for estimating the strength of fine-grained soil. Therefore, the strengths reported on the boring log include these strength values.

Alluvium extends below the estuarine deposits to a depth of ±77 feet. The upper alluvium consists of soft, high plasticity clay to ±25 feet followed by soft to medium stiff, sandy silt with some clay to ±31.5 feet. Dense to very dense sandy gravel with some silt underlies the sandy silt to a depth of ±61 feet. The dense sandy gravel is followed by medium stiff to very stiff clayey silt with some sand from ±61 feet to ±77 feet.

Grey, weak (R1) sandstone (bedrock) consistent with the Flournoy Formation was encountered at ±77 feet and extends to ±80.3 feet, the maximum depth of the boring.

Groundwater

Mud-rotary drilling techniques precluded an accurate ground water measurement at the time of drilling. The retained samples were wet below ±2.5 feet suggesting a relatively shallow groundwater level. Based on a review of water well logs available from the Oregon Water Resources Department (OWRD) in the project vicinity, we anticipate the groundwater level at the site fluctuates between depths of ±2 to 8 feet with the highest groundwater levels expected in the wet winter and spring months. For design purposes, we assumed a groundwater level of ±2.5 feet below the ground surface.

LABORATORY AND FIELD TESTING

Laboratory Testing

The laboratory testing included moisture content (ASTM D2216), percent fines (ASTM D1140), and Atterberg limits (ASTM D4318) tests to help classify the soils according to the Unified Classification System (USCS) and estimate their overall engineering properties. The test results are summarized in Table 1C (Appendix C). The moisture contents are also shown on the boring log (Appendix B). Non-tested samples were visually classified in general accordance with the procedures outlined in ASTM D2487 and ASTM D2488. The USCS symbols shown on the boring log for untested samples should be considered approximations.

Field vane shear tests were performed on the Shelby tube samples obtained from boring BH-1 to estimate the undrained shear strength (S_u) of the predominately fine-grained soils. The recorded values indicate an undrained shear strength ranging from ±0.15 to 0.2 tsf between ±10 and 17 feet.

Resistivity and pH Testing

In-situ resistivity testing (R-1) was completed in the landscaped area south of the existing facility using a Miller 400A 4-pin soil resistance meter. The approximate test location is shown on Figure 2A. The 4-pin resistance meter provides an estimate of the average resistivity of a soil profile extending to a depth equal to the spacing between the pins. The resistivity tests were performed in general accordance with the procedures outlined in ASTM G57 with the pins spaced at ±6, 8, and 12 feet. The recorded values ranged from 5,774 to 33,321 ohm-cm (Ω-cm). The resistivity values are summarized in Table 2C (Appendix C).

pH testing (ASTM G51) was completed on selected samples obtained from depths of ±7.5 to 13.5 feet. The recorded pH values ranged from 6.5 to 7.4, suggesting slightly acidic to slightly alkaline soil conditions. The results are summarized in Table 3C (Appendix C).

SEISMIC ANALYSIS AND EVALUATION

Seismic-Geologic Site Hazards

In accordance with ASCE 41-17, Section 8.2.2 and the 2019 OSSC Section 1803.6.1, we reviewed the potential seismic-geologic site hazards including fault rupture, liquefaction, lateral spread, seismically-induced settlement, seismically-induced landslides (i.e., slope instability), and flooding or inundation. The evaluation of the local seismic hazards is provided in the Site-Specific Seismic Hazard Study Report (Appendix D). The findings of the study indicate the primary seismic-geologic hazards at the site are associated with a large magnitude Cascadia Subduction Zone (CSZ) earthquake.

The improvements are intended to upgrade the structure to accommodate occupancy performance with design accelerations associated with a ±225-year mean return period and to allow for life safety performance for accelerations associated with a ±975-year mean return period.

Site Response Spectra

Design spectral acceleration response parameters were developed for the site in accordance with ASCE 41-17, Section 2.4 for a Risk Category IV structure and the BPOE criteria. ASCE 41-17 identifies two specific Seismic Hazard Levels for these criteria:

- ***Life Safety Structural Performance***. BSE-2E acceleration parameters correspond to USGS 2014 ground motion maps with a 5% probability of exceedance in 50 years (i.e., a ±975-year mean return period).
- ***Immediate Occupancy Structural Performance***. BSE-1E acceleration parameters correspond to USGS 2014 ground motion maps with a 20% probability of exceedance in 50 years (i.e., a ±225-year mean return period).

The spectral accelerations on rock (S_S and S_1) were multiplied by Site Class coefficients (F_a and F_v) to develop the surface spectral accelerations based on the procedures outlined in ASCE 7-16 Chapter 20. Based on the subsurface profile encountered in BH-1, we have concluded a Site Class E is appropriate for design. Design parameters for the various Seismic Hazard Levels are summarized in Table 1. The response spectra based on a Site Class E and 5% structural damping are shown on Figure 3A (Appendix A).

Table 1. Seismic Design Parameters for Selected Seismic Hazard Level

Seismic Hazard Level	Criteria	Site Class	S_S	S_1	F_a	F_v	S_{XS}	S_{X1}
BSE-2E	5%/50 years	E	0.93	0.49	1.3	4.2	1.21	2.07
BSE-1E	20%/50 years	E	0.16	0.07	2.4	4.2	0.37	0.30

Notes:
1. Seismic Hazard Level criteria are defined in ASCE 41-17, Section 2.4.
2. MCE_R is defined in ASCE 7-16, Section 11.4, as the Risk-Targeted Maximum Considered Earthquake.
3. Short-period (S_S) and 1-second (S_1) spectral accelerations on rock were determined based on the USGS 2014 Seismic Hazard Maps used in ASCE 7-16.
4. Site Class was determined based on ASCE 7-16 Chapter 20. Site class coefficients, F_a and F_v, were determined based on ASCE 7-16 Tables 11.4-1 and 11.4-2.
5. Site-adjusted spectral acceleration parameters, S_{XS} and S_{X1}, are equal to S_SF_a and S_1F_v, respectively.

Liquefaction

Liquefiable soils typically consist of saturated, loose sand and non-plastic or low plasticity silt (i.e., PI less than 8). The subsurface conditions at the site include potentially liquefiable layers of loose sand to a depth of 7.5 feet and soft to medium stiff sandy silt from 25 to 31.5 feet. The very soft to soft organic clayey silt 7.5 to 20.5 feet may also experience a seismically induced loss of strength and settlement due to strain-softening.

The 2019 OSSC recommends evaluating liquefaction based on the requirements of ASCE 7-16 Section 21.5 (ASCE, 2016). ASCE 7-16 Section 21.5 requires evaluating the liquefaction hazard using the probabilistic maximum considered earthquake (MCE) peak ground acceleration (PGA) or using a deterministic approach with a mean plus one standard deviation (84th percentile) ground motions.

Seismic Sources. The potential seismic sources, design bedrock accelerations, and earthquake magnitudes were selected based on the current 2014 USGS seismic maps (USGS, 2014a and USGS, 2014b). Each seismic source can be identified based on its magnitude (M) and source-to-site distance (R). The sources that have the greatest contribution to the overall uniform, seismic hazard is highlighted in a process termed deaggregation. The relative contributions to the seismic hazard were evaluated for return periods of 225 years, 975 years, and 2475 years and are summarized in Table 2.

Table 2. Summary of the Relative Contribution of Seismic Hazards

Return Period	Crustal	Slab	Interface
225 years	20.0%	9.3%	70.3%
975 years	0.5%	1.0%	98.5%
2475 years	0.2%	0.6%	99.2%

CSZ interface earthquakes occur at the inclined interface between the subducting oceanic plate and the overriding continental plate. The interactive deaggregation indicates moment magnitudes (M_w) ranging from 8.3 to 9.3 for CSZ interface earthquake sources at distances of 24 to 30 km from the site.

CSZ intraslab earthquakes occur within the subducting plate at depths of 28 to 37 miles. The interactive deaggregation indicates M_w values ranging from 6.5 to 7.9 for CSZ intraslab earthquake sources at distances of 50 to 110 km from the site.

Crustal earthquakes occur within the North American plate, typically at depths of 6 to 12 miles. The interactive deaggregation indicates a M_w 6.3 crustal earthquake on the South Slough Thrust and Reverse fault located ±50 km from the site.

We used ground motion prediction equations (GMPEs) to calculate deterministic peak bedrock accelerations ($PGA_{Bedrock}$) for 50 percentile (mean) and 84 percentile (mean plus one standard deviation) ground motions. Based on the interactive deaggregation, we assumed a M_w 9 CSZ interface earthquake at a distance of 24 km. The peak $PGA_{Bedrock}$ values were multiplied by a site amplification factor (F_{pga}) determined from ASCE 7-16 to calculate peak ground surface accelerations ($PGA_{Surface}$). The calculated $PGA_{Bedrock}$, F_{pga}, and $PGA_{Surface}$ values are summarized in Table 3. The calculations indicate relatively high ground shaking for all scenarios.

Table 3. Selected Magnitude, Distance, and PGA for Liquefaction Analysis

Earthquake Scenario	Ground Motion Criterion	$PGA_{Bedrock}$ (g)	F_{pga}	$PGA_{Surface}$ (g)
Crustal (South Slough) M_w = 6.3, R = 50 km, D = 0 km	50th Percentile	0.14	2.22	0.31
	84th Percentile	0.25	1.75	0.44
CSZ Intraslab M_w = 7.1, R = 50 km D = 50 km	50th Percentile	0.25	1.74	0.44
	84th Percentile	0.51	1.20	0.61
CSZ Interface M_w = 9.0, R = 24 km D = 25 km	50th Percentile	0.46	1.28	0.59
	84th Percentile	0.89	1.20	1.07

Liquefaction-Induced Settlement. We completed liquefaction analysis using information from BH-1 and the $PGA_{Surface}$ values summarized in Table 3. The analysis was completed using the SPT-based procedures established from the findings of a 1996 National Center for Earthquake Engineering Research (NCEER) workshop and a 1998 NCEER/NSF workshop (Youd et al., 2001) with recent updates by Idriss and Boulanger (2010). The SPT N-values recorded in the boring were corrected for an effective overburden pressure of 1 tsf and a hammer energy of 60%, as well as additional factors including the type of hammer, borehole diameter, rod length, and sampling method.

The results indicate the potential for liquefaction of the submerged loose sand and soft sandy silt layers for each of the earthquake scenarios described above. Liquefaction settlement due to strain-softening of the soft fine-grained material below the groundwater level was also analyzed. Settlement due to strain-softening was evaluated based on the calculated factors of safety (FS) against liquefaction assuming 1 to 3.5 percent volumetric strain. The calculations indicate total seismic settlement of ±3.5 to 7.5 inches are expected at the site.

Lateral Spread

Reedsport is bordered to the north by the Umpqua River. We anticipate the liquefiable soils extend into the river. Therefore, the adjacent ground is susceptible to liquefaction-induced lateral spread (i.e., lateral soil movement) during or following a moderate to large magnitude earthquake. The project site is relatively flat and located more than 1,000 feet away from the riverbank. Therefore, the risk of lateral spread impacting the Station 7 site is relatively low.

Tsunami Inundation

Tsunami are waves created by a large-scale displacement of the sea floor due to earthquakes, landslides, or volcanic eruptions. The DOGAMI tsunami inundation maps for Reedsport (DOGAMI, 2013) indicate the site is located within the anticipated inundation zone for a tsunami associated with a CSZ interface earthquake. The DOGAMI inundation map for a CSZ interface source includes a variety of inundation scenarios ranging from small (S) to extra extra large (XXL). The inundation depends on several factors including the size of the earthquake and the height of the tide at the time of the tsunami. The maximum runup elevation associated with a XXL tsunami is expected to be on the order of El. 20.

The ASCE Tsunami Hazard Tool (ASCE, 2021) provides a recommended design runup elevation of El. 15.4 (NAVD88), which approximately corresponds to a DOGAMI large (L) tsunami scenario. The ground surface elevation at the site was estimated using the DOGAMI Lidar Viewer (DOGAMI, 2021) and is assumed to lie at ±El. 11.3. Therefore, the site is expected to be inundated during a CSZ interface earthquake.

DISCUSSION OF GEOTECHNICAL CONSIDERATIONS

Impact and Mitigation of Seismic Hazards

There are several seismic hazards at the site including liquefaction, subsidence, ground amplification, and tsunamic inundation. The most significant seismic hazard at the site is due to a CSZ interface event. Due to the relatively long recurrence interval of the CSZ interface earthquake, we anticipate that the current retrofit work is focused on addressing a crustal or CSZ intraslab earthquake.

Liquefaction and Liquefaction-Induced Settlement. Our analyses indicate a significant hazard associated with liquefaction and liquefaction-induced settlement for each of the design earthquake scenarios. We understand micropiles or small diameter driven piles are planned to underpin the existing foundations. The piles should extend below the liquefiable layers and be imbedded into the dense to very dense gravel stratum from ±31.5 to 61 feet below ground surface. A more detailed discussion of the design considerations for piles is provided in a subsequent section of this report.

Subsidence and Tsunami Inundation. Ground subsidence is a regional phenomenon which cannot be mitigated. Ground subsidence is expected to occur during a larger magnitude interface earthquake. Modeling of a large magnitude CSZ earthquake suggests that this portion of the coast may drop up to ±7.2 feet. Likewise, the tsunami hazard could have significant impacts at the site depending on the magnitude of the CSZ event.

The currently proposed improvements are intended to improve seismic performance of the building foundations; however, mitigation of all seismic hazards from potential earthquakes at the site will not be practical due to the location. The tsunami and subsidence hazard will be dependent on the location and magnitude of the earthquake. Therefore, it will be necessary to evaluate the condition of the facility and make repairs, as needed following an earthquake. A tsunami is likely to occur relatively quickly following a local CSZ interface earthquake. Therefore, we recommend an evacuation plan be in place for the facility.

ENGINEERING ANALYSIS

Discussion of Existing Foundations and Proposed Underpinning

We understand that as-built drawings for the existing structure are not available. The structure is expected to be supported by relatively shallow foundations constructed on the loose sand fill. We assume the existing foundations have been designed using a bearing pressure of 1,500 lb/ft^2 (psf) or less. The existing foundations are expected to be impacted by potentially large differential settlement in a design seismic event. Therefore, underpinning of the existing shallow foundations is planned to provide axial support in the deeper soils that are not susceptible to significant strength loss or settlement during a seismic event. Either driven piles or hollow-bar micropiles could be used for underpinning elements. Driven pile foundations are expected to include 3 or 4-inch diameter steel piles. Hollow-bar micropiles are expected to be utilized if micropiles are selected. We understand that axial capacities of 20 kips or less will be required for individual pile foundations, which is within the typical range for hollow bar or 4-inch diameter steel pile installations.

Preliminary design drawings provided by ZCS indicate that the portion of the structure that is being updated will include construction of new piles that are connected to the existing footings. The improvements may also include new footings that are supported on piles.

The work on the perimeter footings is expected to be completed from the exterior of the building. However, several interior footings will also require pile installation. Therefore, we anticipate that relatively small equipment with low headroom requirements will be required for the work.

Micropile Axial Capacity

The upper fill, the organic clayey silt, and the underlying soft clay and sandy silt are all unsuitable bearing layers for the new micropiles. Therefore, the bond zone for the piles is expected to be limited to the dense to very dense sandy gravel below a depth of ±31.5 feet. Our calculations and previous experience with similar soil conditions suggest an ultimate axial resistance of ±2.5 to 4 kips/foot is expected within the gravel stratum for ±4 to 5-inch diameter grouted-in-place micropiles. Extending the micropiles through the upper loose and soft soil is expected to require the use of casing to limit the risk of caving.

The design capacity for the grouted micropiles should be established as a performance specification. Therefore, the specialty contractor installing the piles will be given control over certain design and construction elements but will be required to demonstrate the proposed materials and installation method meet the specified performance. We recommend a sacrificial verification pile be constructed and tested prior to the installation of the production piles using the proposed materials and installation techniques for the work. The use of the verification pile will also allow a factor of safety of 2 for determining the allowable capacity. We anticipate the verification pile will be tested in tension and will provide a conservative estimate of the ultimate capacity of the pile in compression.

Regardless of the required capacity, we recommend a minimum pile embedment of 5 feet into the gravel stratum. Therefore, we anticipate that all micropiles will extend to depths of ±36 feet or greater.

Driven Pile Axial Capacity

The upper fill, the organic clayey silt, and the underlying soft clay and sandy silt are all unsuitable bearing layers for piles. Therefore, the piles are expected to be driven into the dense to very dense sandy gravel below a depth of ±31.5 feet. Our calculations and previous experience with similar soil conditions suggest 4-inch diameter piles will develop capacity relatively quickly within this stratum in end-bearing. Driven piles have the advantage over micropiles of not requiring casing through the upper loose and soft soil. Therefore, we anticipate driven piles may be more cost effective.

The design capacity for the driven piles should be established as a performance specification. Therefore, the specialty contractor installing the piles will be given control over certain design and construction elements but will be required to demonstrate the proposed materials and installation method meet the specified performance. We recommend that a sacrificial verification pile be constructed and tested prior to the installation of the production piles using the proposed materials and installation techniques for the work. The use of the verification pile will also allow a factor of safety of 2 for determining the allowable capacity. The driven piles are not expected to develop significant capacity in tension. Therefore, we anticipate the verification pile will be tested in compression. Similar to the micropiles, we anticipate the driven piles will extend to depths of ±36 feet.

New Footings

All new foundations will be supported by driven piles or grouted micropiles due to the underlying soft organic estuary deposits. We anticipate the new footings will be placed a minimum of 2 feet below the finished floor bearing on a minimum of 12 inches of compacted Base Aggregate underlain by compacted sand fill.

Settlement

The building was constructed several decades ago. The site includes sand fill overlying soft organic estuary deposits that are expected to experience long-term consolidation. We anticipate that moderate settlement has already occurred at the site. However, minor settlement from secondary consolidation will likely continue in the future.

The proposed underpinning work may encounter voids beneath existing footings and floor slabs due to settlement. To the extent practical, we recommend that any voids beneath the existing footings and slabs be filled with structural fill or grout at the time of the underpinning work.

The new piles will extend through the upper organic soils expected to experience most of the settlement. Therefore, the pile foundation elements are expected to have total settlement of less than ± ½ inch.

Sliding Coefficient and Passive Resistance for Footings

For sliding analysis, we recommend assuming a coefficient of friction of 0.25 between the base of the footings and the subgrade. This value assumes that the footings bear on the loose sand fill.

Passive resistance of the soil in front of the footings was calculated as an equivalent fluid density equal to $\gamma_m * K_p$, where γ_m is the moist unit weight of the soil and K_p is the passive earth pressure coefficient. We anticipate most of the footings were backfilled with sand or imported structural fill. For these conditions, we calculated the passive pressure on the footings assuming an internal friction angle (ϕ) of 28 degrees and an γ_m of 110 lb/ft^3 (pcf). The calculations indicate the ultimate passive resistance may be modeled using an equivalent fluid density of 300 pcf. An allowable passive resistance of 150 pcf is recommended for design and includes a typical factor of safety of 2.

The sliding resistance and passive resistance are additive but will develop their full capacity at different displacements. The full sliding resistance will develop with very little lateral movement. Mobilization of the full passive resistance may require a lateral displacement correlating to 2% of the footing height. This corresponds to a displacement of ±0.5 inch for 2-foot-tall footings.

Pavement Analysis and Design

We understand the project will include a new, rigid apparatus bay apron and flexible pavement to repair the existing road subsequent to curb installation. The following sections summarize the analysis and design for the planned pavements.

Flexible Pavements. We anticipate the base rock section will be required to support heavy construction traffic prior to paving and the completed pavement section will support traffic including light passenger vehicles, aid units, and heavy fire engines. Based on the anticipated construction approach and traffic, we recommend providing a minimum pavement section of 5 inches of AC over 12 inches of base rock if the pavements are constructed during dry weather when the sand subgrade can be compacted. The base rock thicknesses should be increased to 24 inches and a separation geotextile should be used in the event the pavements are constructed during wet weather conditions, or if the pavement areas will be used for staging or repeated construction traffic that extends into wet weather.

Apparatus Bay Apron. A rigid pavement section is planned for the apparatus bay apron. The *Oregon Department of Transportation (ODOT) Pavement Design Guide* (2019) recommends a minimum Portland cement concrete (PCC) thickness of 8 inches regardless of the design traffic load. Based on the anticipated loading conditions of the apron, we recommend providing a minimum rigid pavement section of 8 inches of PCC over 8 inches of base rock underlain by compacted sand subgrade. We recommend doweling the joints between the pavement slabs to reduce the risk of faulting between adjacent panels. The base rock thicknesses should be increased to 24 inches and a separation geotextile should be used in the event the pavements are constructed during wet weather conditions when it is not practical to compact the subgrade soils.

RECOMMENDATIONS

General Earthwork Specifications

1. Base Aggregate, as defined in this report, should consist of ¾- or 1-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded crushed gravel or rock. A material gradation sheet should be provided to us for approval prior to delivery to the site.

2. Granular Site Fill as defined in this report should consist of 3- or 4-inch minus, clean, (i.e., less than 5% passing the #200 U.S. Sieve), well-graded crushed rock. A material gradation should be provided to us for approval prior to delivery to the site.

3. Subsurface Drainage Geotextile should be a non-woven geotextile with Mean Average Roll Value (MARV) strength properties meeting the requirements of AASHTO M 288-17 with a minimum permittivity of 0.1 $sec.^{-1}$ and an AOS less than 0.6 mm. We should be provided a specification sheet for the selected geotextile for approval prior to delivery to the site.

The Separation Geotextile should be laid smooth, without wrinkles or folds, in the direction of construction traffic. Overlap adjacent rolls a minimum of 2 feet. Pin fabric overlaps or place the Base Aggregate in a manner that will not separate the overlap during construction. Seams that have separated will require removal of the Base Aggregate to establish the required overlap.

4. Compact the granular fill in loose lifts not exceeding 12 inches. Thinner (6-inch) lifts are required where light or hand-operated equipment is used. Compact the Base Aggregate and sand subgrade to a minimum of 95% relative compaction. The maximum dry density of ASTM D698 should be used as the standard for estimating relative compaction.

   Field density tests should be run frequently to confirm adequate compaction of the imported granular fills. Granular fills containing aggregate too coarse for density testing should be proof-rolled using a loaded 10-yd^3 dump truck or other approved vehicle or method. A representative of Foundation Engineering should evaluate efficient compaction. Areas of pumping or deflection observed beneath the truck wheels should be reworked or overexcavated and replaced with additional compacted Base Aggregate and proof-rolled again.

5. Shoring for temporary excavations should conform to Oregon OSHA regulations (OR-OSHA, 2011). An OSHA Type C soil is appropriate for the loose coarse-grained soils. Seepage may occur in excavations during winter months when elevated groundwater levels are expected. A running sand condition should be expected if seepage is present in required excavations. Worker's safety in trenches or excavations is the sole responsibility of the contractor.

Design and Retrofit of Footings

We recommend that new and existing foundations be designed in general accordance with the following recommendations.

6. Use design axial loads of up to 20 kips for the underpinning elements at the structure. We have assumed that underpinning element capacity would be verified with a verification pile tested to an axial capacity two times the design load. Special inspection of the production piles will be required to verify the construction methods, minimum embedment depths.

7. Design the foundations and structural upgrades using the seismic parameters provided in Table 1 and shown on Figure 3A (Appendix A).

8. Assume piles could settle up to ± ½ inch. Several inches of liquefaction-induced settlement are expected. Therefore, we anticipate that mitigation of settlement will be required following an earthquake at the site.

9. Use of coefficient of friction of 0.25 at the base of the footings for analysis of sliding resistance, assuming the footings bear on sand. This coefficient may be used with an allowable passive resistance of 150 pcf, assuming the foundations are backfilled with compacted sand or Base Aggregate.

10. Excavate for new footings using an excavator equipped with a smooth-edged bucket. The excavation should extend to the depth required to accommodate 12 inches of Base Aggregate beneath the footings. The base dimensions should extend at least ±12 inches beyond the edges of the footings.

11. Compact the sand subgrade in the bottom of the excavation as recommended in Item 4.

12. Place and compact the Base Aggregate in the footing excavations as recommended in Item 4.

Grouted Micropile

13. Specify grouted micropile or driven pile underpinning elements with the required design load (DL). A qualified specialty contractor with previous experience designing and constructing piles will be required for the work. Specify any equipment limitations for interior work within the structure.

14. The micropile contractor will be responsible for submitting the micropile design for review and approval by the engineer prior to mobilization. The design should include all equipment to be used in the pile installation and materials to be used in the piles including casing, reinforcing, connectors, bearing plates, bits, and grout. The design should include a summary of the installation process, minimum bond zone, pile diameter and estimated capacity.

15. There is a high risk of caving or running of the sand fill, especially in the presence of groundwater. Therefore, the contractor should plan to provide temporary casing through at least the sandy fill to prevent the formation of voids under the floor slab.

16. Ultimate capacity for the micropiles should be calculated using a factor of safety of 2. At least one verification pile should be constructed and tested at the site prior to installing the production piles. Additional verification piles may be required if different installation equipment or methods are required for interior piles. Verification testing should be completed to the ultimate capacity (i.e., 2 x DL). Observation and acceptance of the verification testing should be completed by the engineer.

17. If micropiles are constructed, the verification pile should include an unbonded zone extending to the surface of the dense sandy gravel (estimated depth of ±31 feet).

18. Specify that all grouted micropiles extend at least 5 feet into the dense sandy gravel stratum. Therefore, a minimum pile embedment depth of ±36 feet is anticipated. Deeper embedment may be required based on the contractor's design.

Driven piles

19. The driven pile contractor will be responsible for submitting the proposed pile material and installation equipment for review and approval by the engineer prior to mobilization. The submittal should also include all equipment to be used in the verification pile testing and pile materials including connectors and caps.

20. Ultimate capacity for the driven piles should be calculated using a factor of safety of 2. At least one verification pile should be constructed and tested at the site prior to installing the production piles. Additional verification piles may be required if different installation equipment or methods are required for interior piles. Verification testing should be completed to the ultimate capacity (i.e., 2 x DL). Observation and acceptance of the verification testing should be completed by the engineer.

21. Specify that driven piles develop axial capacity in the dense sandy gravel below a depth of 31 feet.

Pavement Construction

22. Excavate the pavement areas as required to accommodate the minimum pavement sections. Complete the excavation using an excavator equipped with a smooth-edged bucket to minimize subgrade disturbance for work completed during wet weather.

    During dry weather, the excavation depth should accommodate a minimum base rock section of 8 inches of Base Aggregate for PCC pavements and 12 inches of Base Aggregate for AC pavements. Compact the sand subgrade prior to placement of the Base Aggregate to provide a firm, non-yielding surface.

    During wet weather, increase the base rock section thickness to 24 inches. The increased base rock section may consist of 24 inches of Base Aggregate or 6 inches of Base Aggregate (base rock) over 18 inches of Granular Site Fill (subbase). Do not compact the subgrade during wet weather. Place a Separation Geotextile over the approved subgrade as recommended in Item 3.

    Overexcavate any soft subgrade and replace it with compacted Base Aggregate or Granular Site Fill.

23. Proof-roll the prepared base rock section prior to paving. Overexcavate and replace any areas of pumping base rock and/or subgrade with additional Base Aggregate or Granular Site Fill.

24. Provide a minimum of 5 inches of AC for flexible pavement areas. We recommend using Level 3 AC with PG 64-22 binder. Compact the AC to a minimum of 91% relative compaction per the theoretical maximum density calculated from the Rice specific gravity.

25. Provide 8 inches of PCC for the apron. Specify a 28-day minimum compressive strength of 4,000 psi and a 28-day minimum flexural strength of 600 psi for the PCC.

DESIGN REVIEW/CONSTRUCTION OBSERVATION/TESTING

Foundation Engineering should be provided the opportunity to review all drawings and specifications that pertain to new foundations or the retrofit of existing foundations including the pile submittal. We recommend we be present to confirm verification pile performance and the soil conditions beneath any new or widened footings prior to backfilling. Mitigation of any unexpected foundation conditions such as unsuitable fill, voids, high plasticity clay, soft soils, or persistent ground water infiltration will also require engineering review and judgment. That judgment should be provided by one of our representatives.

VARIATION OF SUBSURFACE CONDITIONS, USE OF THIS REPORT, AND WARRANTY

The analyses, conclusions, and recommendations contained herein assume the soil conditions encountered in the boring are representative of the overall site conditions. The above recommendations assume we will have the opportunity to review final drawings and be present during construction to confirm the assumed foundation conditions. No changes in the enclosed recommendations should be made without our approval. We will assume no responsibility or liability for any engineering judgment, inspection, or testing performed by others.

This report was prepared for the exclusive use of ZCS Engineering & Architecture, Inc., and the design consultants for the Station 7 Seismic Evaluation project in Reedsport, Oregon. Information contained herein should not be used for other sites or for unanticipated construction without our written consent. This report is intended for planning and design purposes.

Contractors using this information to estimate construction quantities or costs do so at their own risk. Our services do not include any survey or assessment of potential surface contamination or contamination of the soil or groundwater by hazardous or toxic materials. We assume those services, if needed, have been completed by others.

Our work was done in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

REFERENCES

ASCE, 2016, *ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, American Society of Civil Engineers (ASCE).

ASCE, 2017, *ASCE 41-17, Seismic Evaluation and Retrofit of Existing Buildings*, American Society of Civil Engineers (ASCE).

ASCE, 2021, *ASCE Tsunami Hazard Tool:* ASCE (American Society of Civil Engineers) ASCE/SEI 7-22, ASCE Tsunami Design Geodatabase Version 2022-1.0, updated December 2021, Risk Category IV, Site Soil Class D, accessed May 2022.

DOGAMI, 2013, *Tsunami Inundation Maps - Reedsport, Douglas County, Oregon, Local Source (Cascadia Subduction Zone) and Distant Source (Alaskan-Aleutian Subduction Zone):* Oregon Department of Geology and Mineral Industries (DOGAMI), TIM-Doug04, Scale = 1:12,000.

DOGAMI, 2021, *Light Detection and Ranging (LiDAR) Viewer:* Oregon Department of Geology and Mineral Industries (DOGAMI), website: https://www.oregongeology.org/lidar/index.htm, last updated April 2021, accessed May 2022.

IBC, 2018, *International Building Code*: International Code Council, Inc., Sections 1613 and 1803.3.

Idriss, I.M. and Boulanger, R.W., 2010, *SPT-Based Liquefaction Triggering Procedures*, Department of Civil and Environmental Engineering, College of Engineering, University of California at Davis, Report No. UCD/CGM-10/02.

ODOT, 2019, *ODOT Pavement Design Guide*: Oregon Department of Transportation (ODOT), Pavement Services Unit.

OR-OSHA, 2011, *Oregon Administrative Rules, Chapter 437, Division 3 - Construction, Subdivision P – Excavations*: Oregon Occupational Safety and Health Division (OR-OSHA).

OSSC, 2019, *Oregon Structural Specialty Code (OSSC)*: Based on IBC 2018, Sections 1613 and 1803.3.

USGS, 2014a, *National Seismic Hazard Mapping Project, US Seismic Design Maps*: U.S. Geological Survey (USGS) website: http://earthquake.usgs.gov/designmaps/us/application.php.

USGS, 2014b, *Earthquake Hazards Program, Interactive Deaggregations, Dynamic Conterminous U.S. 2014 (v.4.2.0)*: U.S. Geological Survey (USGS), latitude/longitude search, reference material has no specific release date, accessed May 2022, website: https://earthquake.usgs.gov/hazards/interactive/index.php.

Youd, T.L. et al., 2001, *Liquefaction resistance of soils: Summary report from the 1996 NCEER and 1998 NCEER/NSF workshops on evaluation of liquefaction resistance of soils*: ASCE Journal of Geotechnical and Environmental Engineering, Vol. 127, No. 10, October 2001, pp. 817-833.

Appendix A

Figures

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Source: *ODOT City Maps (Reedsport, Douglas County), 2021 ed.*

SCALE IN FEET

0 800 1,600 3,200

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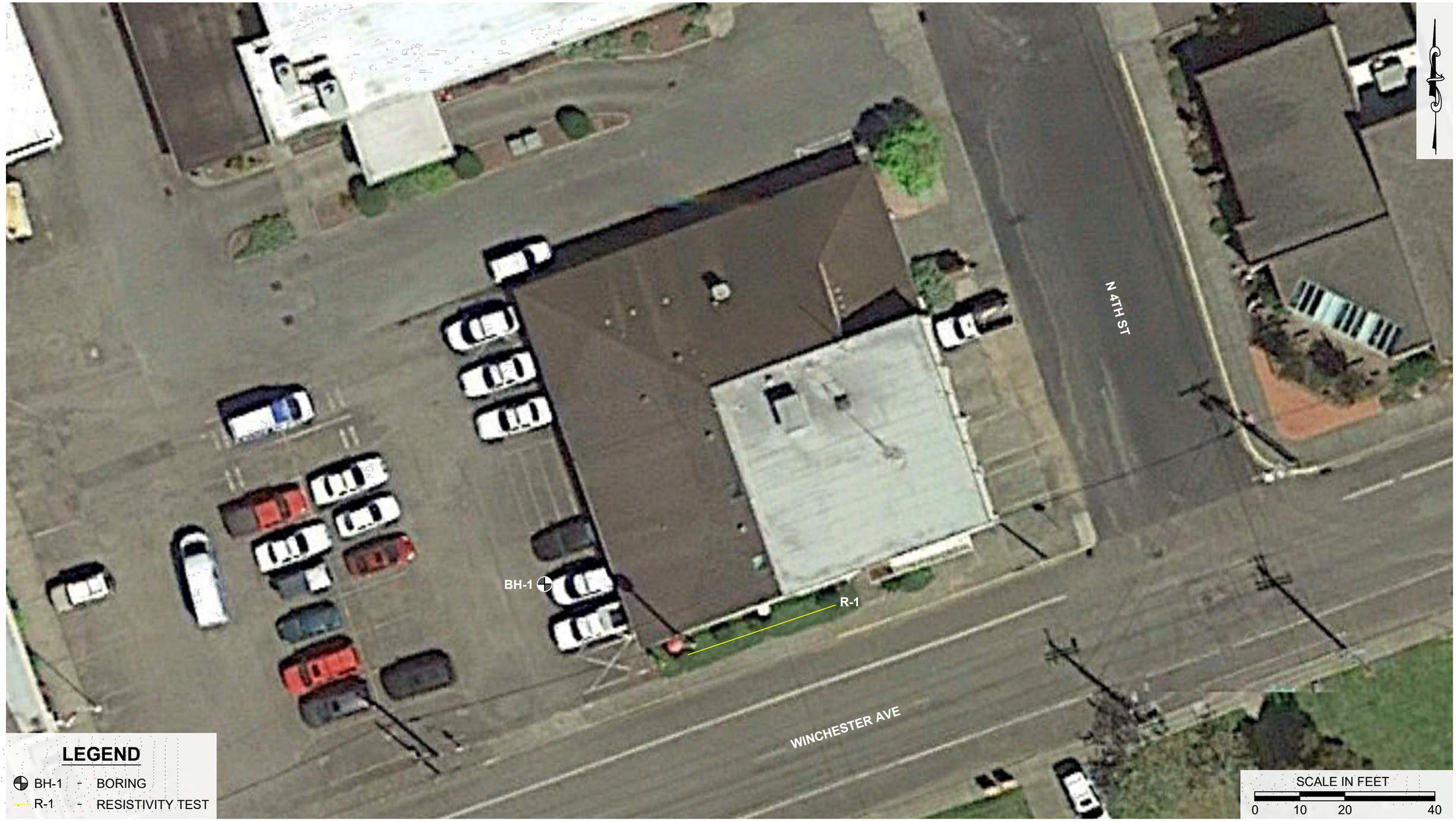
PROJECT NO.	DATE:	DRAWN BY:
2221038	May. 9, 2022	MDM

VICINITY MAP

STATION 7 SEISMIC EVALUATION
REEDSPORT, OREGON

FIGURE NO.

1A



NOTES:
1. EXPLORATION LOCATIONS ESTABLISHED REFERENCING EXISTING LANDMARKS AND ARE APPROXIMATE.
2. SEE REPORT FOR A DISCUSSION OF SUBSURFACE CONDITIONS.
3. AERIAL IMAGE WAS OBTAINED FROM GOOGLE EARTH PRO.
4. SCALE SHOWN IS APPROXIMATE.

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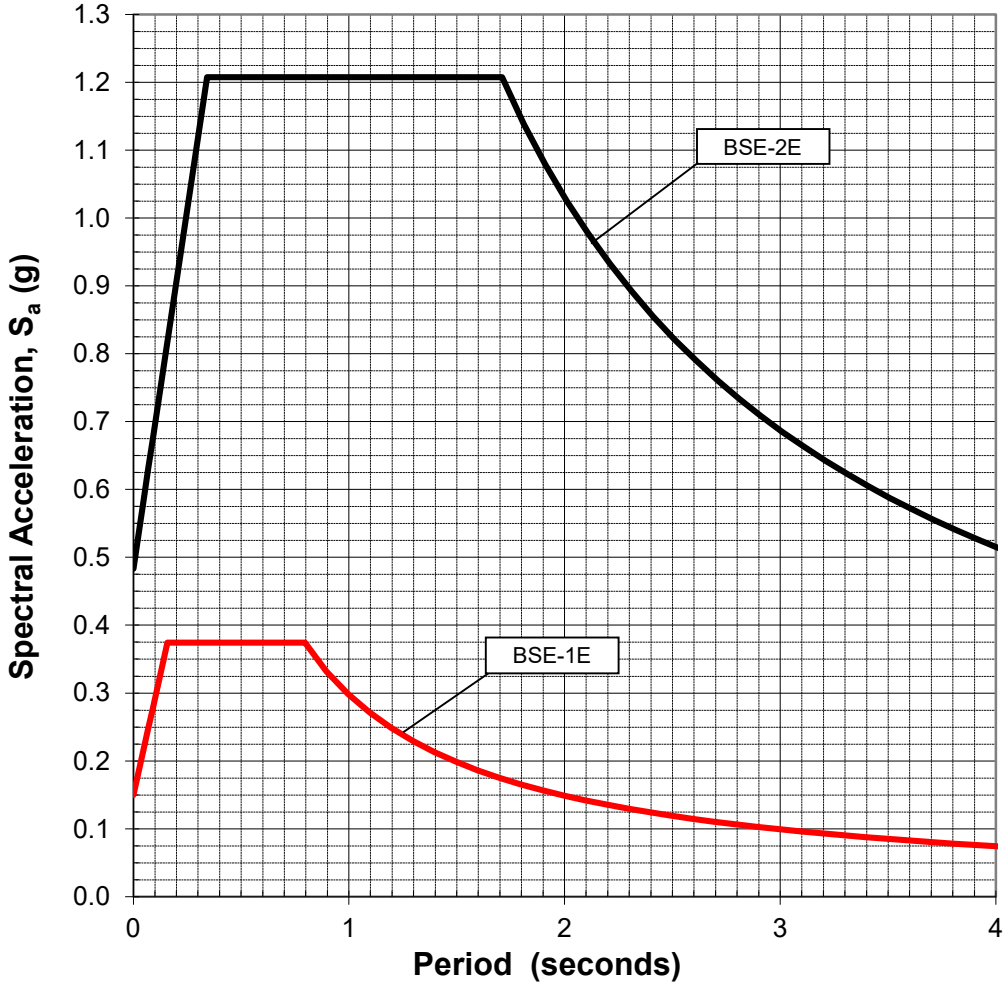
PROJECT NO.	DATE:	DRAWN BY:
2221038	MAY 2022	MLM

EXPLORATION LOCATIONS

STATION 7 SEISMIC EVALUATION
REEDSPORT, OREGON

FIGURE NO.
2A



Notes:

1. The General Procedure Response Spectra are based on ASCE 41-17, Section 2.4.
2. The following parameters are based on USGS 2014 Seismic Hazard Maps and the ASCE 7 Risk-Targeted Maximum Considered Earthquake (MCE_R) ground motion maps:

	Site Class =	E	Damping =	5%	B_1 =	1.0		
BSE-2E	S_S =	0.93	F_a =	1.30	S_{XS} =	1.21	T_0 =	0.34
	S_1 =	0.49	F_v =	4.20	S_{X1} =	2.07	T_S =	1.71
BSE-1E	S_S =	0.16	F_a =	2.40	S_{XS} =	0.37	T_0 =	0.16
	S_1 =	0.07	F_v =	4.20	S_{X1} =	0.30	T_S =	0.80

3. F_a and F_v were selected based on ASCE 7-16 Tables11.4-1 and 11.4-2 and the Site Class.
4. Site location is: Latitude 43.7018, Longitude -124.0969.

FIGURE 3A
ASCE 41-17 SITE RESPONSE SPECTRA
Station 7 Seismic Evaluation
Reedsport, Oregon
Project No.: 2221038

Appendix B

Boring Log

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DISTINCTION BETWEEN FIELD LOGS AND FINAL LOGS

A field log is prepared for each exploration by our field representative. The log contains information concerning sampling depths and the presence of various materials such as gravel, cobbles, and fill, and observations of groundwater. It also contains our interpretation of the soil conditions between samples. The final logs presented in this report represent our interpretation of the contents of the field logs and the results of the sample examinations and laboratory test results. Our recommendations are based on the contents of the final logs and the information contained therein and not on the field logs.

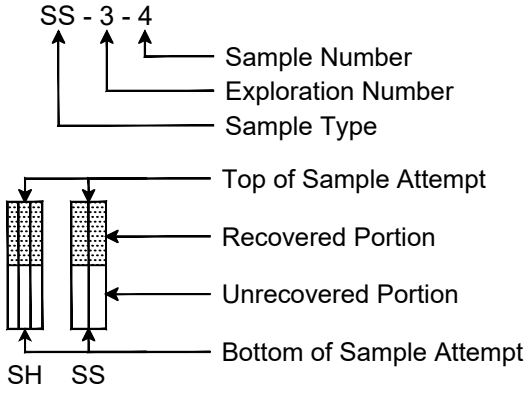
VARIATION IN SOILS BETWEEN EXPLORATIONS

The final log and related information depict subsurface conditions only at the specific location and on the date indicated. Those using the information contained herein should be aware that soil conditions at other locations or on other dates may differ. Actual foundation or subgrade conditions should be confirmed by Foundation Engineering during construction.

TRANSITION BETWEEN SOIL OR ROCK TYPES

The lines designating the interface between soil, fill or rock on the final logs and on subsurface profiles presented in the report are determined by interpolation and are therefore approximate. The transition between the materials may be abrupt or gradual. Only at boring or test pit locations should profiles be considered as reasonably accurate and then only to the degree implied by the notes thereon.

SAMPLE AND TEST SYMBOLS



C - Pavement Core Sample
CS - Rock Core Sample
OS - Oversize Sample (3-inch O.D. split-spoon)
S - Grab Sample
SH - Thin-walled Undisturbed Sample
SS - SPT Sample (2-inch O.D. split-spoon)

▲ Standard Penetration Test resistance equals the number of blows a 140 lb. weight falling 30 in. is required to drive a standard split-spoon sampler 1 ft. Practical refusal is equal to 50 or more blows per 6 in. of sampler penetration.

● Water Content (%)

FIELD SHEAR STRENGTH TEST

Shear strength measurements on test pit side walls, blocks of soil or undisturbed samples are typically made with Torvane or Field Vane shear devices. Values reported as undrained shear strength (S_u) in tsf.

GROUNDWATER

▼ Groundwater Location

(1/31/21) Date of Measurement

TYPICAL SOIL/ROCK SYMBOLS

Concrete	Silt	Basalt
Organics	Sand	Sandstone
Clay	Gravel	Siltstone

UNIFIED SOIL CLASSIFICATION SYMBOLS

G - Gravel	W - Well Graded
S - Sand	P - Poorly Graded
M - Silt	L - Low Plasticity
C - Clay	H - High Plasticity
Pt - Peat	O - Organic

Explanation of Common Terms Used in Soil Descriptions

Field Identification	Cohesive Soils			Granular Soils	
	SPT*	S_u** (tsf)	Term	SPT*	Term
Easily penetrated several inches by fist.	0 - 2	< 0.125	Very Soft	0 - 4	Very Loose
Easily penetrated several inches by thumb.	2 - 4	0.125 - 0.25	Soft	4 - 10	Loose
Can be penetrated several inches by thumb with moderate effort.	4 - 8	0.25 - 0.50	Medium Stiff	10 - 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	8 - 15	0.50 - 1.0	Stiff	30 - 50	Dense
Readily indented by thumbnail.	15 - 30	1.0 - 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	> 30	> 2.0	Hard		

* SPT N-value in blows per foot (bpf)
** Undrained shear strength

Term	Soil Moisture Field Description
Dry	Absence of moisture. Dusty. Dry to the touch.
Damp	Soil has moisture. Cohesive soils are below plastic limit and usually moldable.
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is wetter than the optimum moisture content and above the plastic limit.

Term	PI	Plasticity Field Test
Non-plastic	0 - 3	Cannot be rolled into a thread at any moisture.
Low Plasticity	3 - 15	Can be rolled into a thread with some difficulty.
Medium Plasticity	15 - 30	Easily rolled into thread.
High Plasticity	> 30	Easily rolled and re-rolled into thread.

Term	Soil Structure Criteria
Stratified	Alternating layers at least ¼ inch thick.
Laminated	Alternating layers less than ¼ inch thick.
Fissured	Contains shears and partings along planes of weakness.
Slickensided	Partings appear glossy or striated.
Blocky	Breaks along surfaces into smaller lumps or blocks. Slickensides may be visible.
Lensed	Contains pockets of different soils.

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure.
Moderate	Breaks under hard finger pressure.
Strong	Will not break with finger pressure.

Explanation of Common Terms Used in Rock Descriptions

Field Identification		UCS (psi)	Strength	Hardness (ODOT)
Indented by thumbnail.	R0	< 100	Extremely Weak	Extremely Soft
Crumbles under firm blows with geological hammer. Can be peeled by a pocket knife.	R1	100 - 1,000	Very Weak	Very Soft
Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with geological hammer.	R2	1,000 - 4,000	Weak	Soft
Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single blow of geological hammer.	R3	4,000 - 8,000	Medium Strong	Medium Hard
Specimen requires more than one blow of geological hammer to fracture it.	R4	8,000 - 16,000	Strong	Hard
Specimen requires many blows of geological hammer to fracture it.	R5	> 16,000	Very Strong	Very Hard

Term (ODOT)	Weathering Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric.
Moderatedly Weathered	Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Highly Weathered (Predominately Decomposed)	Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident (relict texture). May be reduced to soil with hand pressure.

Spacing (metric)	Spacing (imperial)	Spacing Term	Bedding/Foliation
< 6 cm	< 2 in	Very Close	Very Thin (Laminated)
6 cm - 30 cm	2 in - 1 ft	Close	Thin
30 cm - 90 cm	1 ft - 3 ft	Moderately Close	Medium
90 cm - 3.0 m	3 ft - 10 ft	Wide	Thick
> 3.0 m	> 10 ft	Very Wide	Very Thick (Massive)

Vesicle Term	Volume
Some vesicles	5 - 25%
Highly vesicular	25 - 50%
Scoriaceous	> 50%

Stratification Term	Description
Lamination	< 1 cm (0.4 in) thick beds
Fissile	Preferred break along laminations
Parting	Preferred break parallel to bedding
Foliation	Metamorpic layering and segregation of minerals

RQD %	Designation	RQD %	Designation
0 - 25	Very Poor	75 - 90	Good
25 - 50	Poor	90 - 100	Excellent
50 - 75	Fair		

Rock Quality Designation (RQD) is the cumulative length of intact rock core pieces 4 inches or longer (excluding breaks caused by drilling and handling) divided by run length, expressed as a percentage.

Depth (ft)	Soil / Rock Description and Comments	Elev. Depth	Sample Number and Location	SPT N-Value / Moisture (%) / Core Recovery (%) / RQD (%) (0–50–100)	Backfill/ Installations/ Groundwater
1–2	ASPHALTIC CONCRETE (±3 inches). Dense CRUSHED ROCK (GP); grey, moist, ±¾-inch minus angular rock, (base rock).	0.3			Capped with AC cold patch and gravel
3–7	Loose SAND, some silt (SP-SM); brown, wet, low plasticity silt, fine sand, (fill).	0.8	SS-1-1 (6); SS-1-2 (4)		Backfilled with bentonite chips (±1 to 5 feet)
8–20	Very soft to soft organic clayey SILT, (MH/OH); grey, wet, high plasticity, organics consist of wood debris and grass fibers, (estuarine deposits). Field vane on SH-1-8: S_u= ±0.15 tsf at ±10 feet and ±0.2 tsf at ±12 feet. Some organics below ±15 feet. Field vane on SH-1-6: S_u= ±0.2 tsf at ±17 feet. Trace fine to coarse sand below ±17 feet.	7.5	SS-1-3 (0); SH-1-4; SS-1-5 (1); SH-1-6; SS-1-7 (0); SS-1-8 (4)	>>	Bentonite grout (±5 to 80.3 feet)
21–24	Soft CLAY (CH); grey and iron-stained, moist, high plasticity, (alluvium).	20.5			
25–31	Soft to medium stiff sandy SILT, some clay (ML); grey and iron-stained, wet, medium plasticity, fine sand, (alluvium). Brown and iron-stained below ±26 feet.	25.0	SS-1-9 (3); SS-1-10 (8)		
32–42	Dense to very dense sandy GRAVEL, some silt (GP-GM); brown, wet, low plasticity silt, fine to coarse sand, fine to coarse subrounded to rounded gravel, (alluvium).	31.5	SS-1-11 (43); SS-1-12 (96/10")		

Project No.: 2221038

Surface Elevation: N/A

Date of Boring: April 4, 2022

BORING LOG: BH-1

Station 7 Seismic Evaluation

Reedsport, Oregon

Foundation Engineering, Inc.
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Depth (ft)	Soil / Rock Description and Comments	Log	Elev. Depth	Sample Number and Location	SPT N-Value / Moisture (%) / Core Recovery (%) / RQD (%) (0 – 50 – 100)	Backfill/ Installations/ Groundwater
43						
44						
45				SS-1-13	56	
46						
47						
48						
49						
50				SS-1-14	50/1st 6"	
51						
52						
53						
54						
55				SS-1-15	57	
56						
57						
58						
59						
60				SS-1-16	31	
61	Stiff clayey SILT, some sand (MH); grey, wet, medium plasticity, fine sand, (alluvium).		61.0			
62						
63						
64						
65				SS-1-17	11	
66						
67						
68						
69	Very stiff at ±70 feet.					
70	Moist with scattered organics below ±70 feet.			SS-1-18	16	
71						
72	Sand lens (±6 inches thick) at ±71 feet.					
73						
74						
75	Medium stiff and scattered thin sand lenses below ±75 feet.			SS-1-19	8	
76						
77	Weak (R1) SANDSTONE; grey, fresh, (Flournoy Formation).		77.0			
78						
79						
80				SS-1-20	50/1st 3"	
	BOTTOM OF BORING		80.3			

Project No.: 2221038

Surface Elevation: N/A

Date of Boring: April 4, 2022

BORING LOG: BH-1

Station 7 Seismic Evaluation

Reedsport, Oregon

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Appendix C

Laboratory Testing

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Table 1C. Moisture Contents (ASTM D2216), Percent Fines (ASTM D1140), and Atterberg Limits (ASTM D4318)

Sample Number	Sample Depth (ft)	Moisture Content (%)	Fines (%)	Atterberg Limits			USCS Classification
				LL	PL	PI	
SS-1-1	2.5 – 4.0	29.1					
SS-1-2	5.0 – 6.5	34.2	9.1				
SS-1-3	7.5 – 9.0	136.9		180	78	102	MH
SH-1-4	10.0 – 12.0	61.9					
SS-1-5	12.0 – 13.5	98.8					
SS-1-7	17.0 – 18.5	45.2					
SS-1-8	20.0 – 21.5	34.8					
SS-1-9	25.0 – 26.5	47.0	60.2				
SS-1-10	30.0 – 31.5	42.6	60.1				
SS-1-18	70.0 – 71.5	31.2					
SS-1-19	75.0 – 76.5	35.0					

Table 2C. Summary of Resistivity Testing (ASTMG 57)

Location	Pin Spacing (ft)	Resistivity (Ω-cm)
R-1 (See Figure 2A	6	33,321
	8	30,640
	12	5,774

Table 3C. pH Test Results (ASTM G51)

Sample Number	Sample Depth (ft)	Sample Description	pH
SS-1-3	7.5 – 9.0	Organic clayey SILT (MH/OH)	6.5
SS-1-5	12.0 – 13.5	Organic clayey SILT (MH/OH)	7.4

Appendix D

Seismic Hazard Study

Foundation Engineering, Inc.
Professional Geotechnical Services

SEISMIC HAZARD STUDY

STATION 7 SEISMIC EVALUATION
REEDSPORT, OREGON

INTRODUCTION

This seismic hazard study was completed to identify potential geologic and seismic hazards and evaluate the effect those hazards may have on the proposed project. The study fulfills the requirements presented in the 2019 Oregon Structural Specialty Code (OSSC), Section 1803 for site-specific seismic hazard reports for essential and hazardous facilities and major and special-occupancy structures (OSSC, 2019). Seismic-geologic site hazards listed in ASCE 41-17 are also included in this study.

The following sections provide a discussion of the local and regional geology, seismic and tectonic setting, earthquakes, and seismic hazards. A detailed discussion of the subsurface conditions at the project location, including exploration logs, is provided in the main report.

LITERATURE REVIEW

We reviewed available geologic, seismic, and hazard publications and maps to characterize the local and regional geology and evaluate relative seismic hazards at the site, including a local water well search on the Oregon Water Resources Department (OWRD) website. The literature review included geologic and hazard studies completed in the Reedsport area by the Oregon Department of Geology and Mineral Industries (DOGAMI) and the U.S. Geological Survey (USGS). Information from geotechnical investigations previously conducted by Foundation Engineering, Inc. in the Reedsport area were also reviewed.

Regional Geology

The site is within the Oregon Coast Range, which is a north-south-trending range that includes the foothills and coastal areas to the west. Reedsport is located ±3 miles inland from the coast along the south bank of the Umpqua River and at the confluence with Smith River and Scholfield Creek.

At the western margin of Oregon is the Cascadia Subduction Zone (CSZ). The CSZ is a converging, oblique plate boundary where the Juan de Fuca oceanic plate is being subducted beneath the western edge of the North American continental plate (Geomatrix Consultants, 1995). The CSZ extends from central Vancouver Island, in British Columbia, Canada, through Washington and Oregon to Northern California in the United States (Atwater, 1970). The movement of the subduction zone has resulted in accretion, folding, faulting, and uplift of oceanic and other sediments on the western margin of the North American plate.

During the late Cretaceous (±66 million years ago), the Oregon Coast Range was non-existent and the shoreline crossed eastern Washington and Idaho. To the west, volcanic seamounts were newly forming, outpouring basaltic pillow lava and breccia of the Siletz River Volcanics (early to middle Eocene; ±58 to 44 million years ago). These seamounts were created on top of the eastward moving Gorda and Juan de Fuca plates and eventually accreted to the North American Plate (early Eocene) due to the subducting convergent plate margin (CSZ). As subduction continued, the seamounts subsided creating a forarc basin, which was infilled with thick deposits of Eocene to Miocene marine sediments primarily derived from the Klamath Mountains to the southeast and Idaho Batholith to the east, including the Flournoy and Tyee formations in the Reedsport area. Volumes of ash and pyroclastics from the Western Cascades to the east covered the underlying marine sediments during the Oligocene (±37 to 24 million years ago). (Orr and Orr, 1999)

The Coast Range block was slowly uplifted, resulting in a westward retreat of the sea during the Miocene. Some isolated basins along the shelf were deepened and infilled with mud, silt, and fossiliferous sandstone. Continuing subduction resulted in the folding and faulting of the North American plate. Erosion and stream valleys carved the coastal landscape. (Orr and Orr, 1999)

Continuing uplift and tilting in combination with Pleistocene (<2 million years ago) sea level changes created many terraces along the southern coast. However, due to the retreat and melting of the continental glaciers, the sea level rose during the Holocene (±10,000 years ago). The low-lying areas of the coast were infilled with water creating many of today's bays, coves and marshes. In the Reedsport and Coos Bay areas, natural stream alluviation has not kept pace with sea level rise, resulting in extensive drowning of the bays and streams with tidal influences ranging from 20 to 30 miles upstream. (Orr and Orr, 1999)

Local Geology

Station 7 is located within the east portion of Reedsport between the Umpqua River and the prominent ridge to the south.

Local geologic mapping indicates fill and estuarine deposits overlie alluvium at the site (Beaulieu and Hughes, 1975). Based on our recent exploration, the fill consists of loose sand and the estuarine deposits consist of very soft to soft organic clayey silt. The alluvium consists of clay, silt, sand, and gravel associated with floodplains that drain the nearby elevated areas and deposits associated with the Umpqua River. The Flournoy Formation (middle Eocene, ±46 million years old) underlies the project site and was encountered at ±77 feet; therefore, the bedrock was designated as the Flournoy Formation on the boring log, based on the local geologic mapping (Beaulieu and Hughes, 1975; Newton, 1980).

The subsurface conditions encountered in our exploration are consistent with the mapped local geology. Details are provided in the Subsurface Conditions section of the main report and on the boring log in Appendix B.

Seismic Setting and Local Faulting

We completed a literature review of nearby faults to evaluate the seismic setting and identify the potential seismic sources. The USGS website includes an interactive deaggregation tool, which allows evaluation of the contribution of the various seismic sources to the overall seismic hazard. The USGS interactive deaggregation indicates the seismic hazard at the site is dominated by the CSZ (USGS, 2014b). A discussion of these earthquake sources is provided below.

Cascadia Subduction Zone (CSZ). The site is located ±66 miles east of the surface expression of the CSZ. It is estimated the average rate of subduction of the Juan de Fuca plate under the North American plate is ±37 mm/year in a northeasterly direction, based on Pacific and Mid-Ocean Ridge velocities, geodetic studies of convergence, and magnetic anomalies of the Juan de Fuca plate (Personius and Nelson, 2006; DeMets et al., 2010).

Crustal Faults. Crustal faults are fractures within the North American plate. Numerous faults are presented on local and regional geologic maps. However, not all faults are considered to be active. Because the historical earthquake record is so geologically short, active faults are identified by geologic mapping and seismic surveys.

The USGS has defined four fault classifications based on evidence for displacement within the Quaternary (<1.6 million years) in their US fault database (Palmer, 1983; Personius et al., 2003). The fault classes are defined as follows:

- ***Class A*** – Faults with geologic evidence supporting tectonic movement in the Quaternary known or presumed to be associated with large-magnitude earthquakes.

- ***Class B*** – Faults with geologic evidence that demonstrates the existence of a fault or suggests Quaternary deformation, but either: 1) the fault might not extend deep enough to be a potential source of significant earthquakes or 2) the current evidence is too strong to confidently classify the fault as a Class C but not strong enough to classify it as a Class A.

- ***Class C*** – Faults with insufficient evidence to demonstrate 1) the existence of a tectonic fault, or 2) Quaternary movement or deformation associated with the feature.

- ***Class D*** – Geologic evidence indicates the feature is not a tectonic fault or feature.

Class A and B faults are included in the USGS fault database and interactive fault map. USGS considers 17 features in Oregon to be Class C faults (USGS, 2006a). The closest Class C faults include the Fulmar fault, which is offshore from Coos and Douglas County and the Pony Slough faults located ±20 miles south in North Bend. The USGS does not consider any features in Oregon as Class D (USGS, 2006a).

Local geologic maps indicate no crustal faults are mapped beneath the site (Newton, 1980). Few, primarily northwest-trending inferred crustal faults are mapped within ±10 miles. Thirteen potentially active Quaternary Class A and B crustal fault zones have been mapped by the USGS within ±50 miles of the site (Palmer, 1983; Personius et al., 2003; USGS, 2006a, b, 2014a). These faults are listed in Table 1D. Figure 1D shows the approximate surface projection locations of these faults.

Table 1D. USGS Class A and Class B Crustal Faults within a ±50-mile Radius of the Site [1]

Fault Name and Class	Fault Number	Approximate Length (miles)	Approximate Distance and Direction from Site (miles) [2]	Last Known Deformation (years) [3]	Slip Rate (mm/yr)
Unnamed offshore faults (A)	785	±186 (varies)	offshore >18 W to SW to 50 N	<15,000	1.0 to 5.0
Unnamed Siuslaw River anticline (A)	887	±7.5	±20 NW	<750,000	0.2 to 1.0
South Slough Thrust and Reverse (A)	890	±10	±26 S to SW	<15,000	0.72
South Slough syncline (A)	891	±11	±27 S-SW	<15,000	0.2 to 1.0
East South Slough (A)	889	±5	±29 S-SW	<750,000	<0.20
Sunset Bay-Cape Arago folds and faults (A)	888	±4	±30 SW	<130,000	0.2 to 1.0
Pioneer anticline (A)	892	±9	±33 S-SW	<130,000	0.2 to 1.0
Coquille anticline (A)	893	±17	±36 SW	<15,000	0.28
Heceta Bank structure (A)	795	±11	offshore ±35 NW	<15,000	>5.0
Coos Basin (A)	794	±22	offshore ±46 SW	<15,000	>5.0
Waldport (A)	886	±9	±44 N	<130,000	0.16
Unnamed faults near Sutherlin (B)	862	±17	±49 E-SE	<750,000	<0.20
Cascadia Fold and Fault Belt (A)	784	±301 (varies)	offshore, varies up to ±50 NW, W, and SW	<15,000	1.0 to 5.0

[1] Fault data based on Personius et al., 2003 and USGS, 2006a and b and 2014a.
[2] Distance and direction from site to nearest surface projection of the fault.
[3] Quaternary time period defined at <1.6 million years based on the 1983 Geologic Time Scale (Palmer, 1983).

Historic Earthquakes

Available information indicates the CSZ is capable of generating earthquakes along the inclined interface between the two plates (interface) and within the descending Juan de Fuca plate (intraslab) (Weaver and Shedlock, 1996). The fault rupture may occur along a portion or the entire length of the CSZ (Weaver and Shedlock, 1996).

CSZ Interface Earthquakes. The estimated maximum magnitude of a CSZ interface earthquake is up to a moment magnitude (M_w) 9.3 (Petersen et al., 2014). No significant interface (subduction zone) earthquakes have occurred on the CSZ in historic times. However, several large-magnitude (>M ~8.0, M = unspecified magnitude scale) subduction zone earthquakes are thought to have occurred in the past few thousand years. This is evidenced by tsunami inundation deposits, combined with evidence for episodic subsidence along the Oregon and Washington coasts (Peterson et al., 1993; Atwater et al., 1995).

Numerous detailed studies of coastal subsidence, tsunami, and turbidite deposits have been conducted to develop a better understanding of CSZ earthquakes. The studies include investigations of turbidite deposits in the offshore Cascadia Basin that were used to help develop a paleoseismic record for the CSZ and estimate recurrence intervals for interface earthquakes (Adams, 1990; Goldfinger et al., 2012). Study of offshore turbidites from the last ±10,000 years suggests the return period for interface earthquakes varies with location and rupture length. That study estimated an average recurrence interval of ±220 to 380 years for an interface earthquake on the southern portion of the CSZ, and an average recurrence interval of ±500 to 530 years for an interface earthquake extending the entire length of the CSZ (Goldfinger et al., 2012). Older, deep-sea cores have been re-examined more recently, and the findings may indicate greater Holocene stratigraphy variability along the Washington coast (Atwater et al., 2014). Additional research by Goldfinger for the northern portion of the CSZ suggests a recurrence interval of ±340 years for the northern Oregon Coast (Goldfinger et al., 2016). The most recent CSZ interface earthquake occurred ±322 years ago (January 26, 1700) (Nelson et al., 1995; Satake et al., 1996).

CSZ Intraslab Earthquakes. Intraslab (Intraplate or Wadati-Benioff Zone) earthquakes occur within the Juan de Fuca plate at depths of ±21 to 43 miles (Petersen et al., 2014). The maximum estimated magnitude of an intraslab earthquake is about M_w 7.5 (Petersen et al., 2014). The available record for intraslab earthquakes in Oregon is limited. The available data indicates a M_b 4.6 (compressional body wave magnitude) event occurred in 1963, located ±23 miles east of Salem at a depth of ±29 miles (Barnett et al., 2009). Based on its depth, this earthquake may be considered an intraslab event. The Puget Sound region of Washington State has experienced three intraslab events in the last ±73 years, including a surface wave magnitude (M_s) 7.1 event in 1949 (Olympia), a M_s 6.5 event in 1965 (Seattle/Tacoma) (Wong and Silva, 1998), and a M_w 6.8 event in 2001 (Nisqually) (Dewey et al., 2002).

Crustal Earthquakes. Crustal earthquakes dominate Oregon's seismic history. Crustal earthquakes occur within the North American plate, typically at depths of ±6 to 12 miles. The estimated maximum magnitude of a crustal earthquake in Oregon is about M_w 7.0 (Petersen et al., 2014). Only two historic crustal events in Oregon have reached Richter local magnitude (M_L) 6 (the 1936 Milton-Freewater M_L 6.1 earthquake and the 1993 Klamath Falls M_L 6.0 earthquake) (Wong and Bott, 1995). The majority of Oregon's larger crustal earthquakes are in the M_L 4 to 5 range (Wong and Bott, 1995).

Table 2D summarizes earthquakes with a M of 4.0 or greater or Modified Mercalli Intensity (MMI) of V or greater, that have occurred within a ±50-mile radius of Reedsport in the last ±189 years (Johnson et al., 1994; USGS, 2013; NCEDC, 2014). One earthquake not included in Table 2D was reported on May 28, 1928, and it occurred a short distance off the Douglas County coast with a MMI of V or less (Beaulieu and Hughes, 1975). This earthquake was felt in North Bend and Gardiner; however, observations were limited to local reports and areas of higher sensitivity. Note that the referenced earthquake catalogs are a composite of different earthquake catalogs and seismic networks; therefore, data errors may exist. Complete historic earthquake records may not yet be included in the referenced earthquake catalogs. Therefore, it is possible some earthquakes may not be included in Table 2D.

Table 2D. Historic Earthquakes Within a ±50-mile Radius of the Site [(1)]

Year	Month	Day	Hour	Minute	Latitude	Longitude	Depth (miles)	Magnitude or Intensity [(2)]
1959	10	31	19	22	44.0	-125.0	unknown	M_b = 4.1
1989	06	11	12	00	44.5	-124.9	6.2	M_b = 4.1
2004	07	12	16	45	44.3	-124.5	16.1 to 17.9	$M_{c/d}$ = 4.9

(1) The site is located at Latitude 43.701822, Longitude -124.096923.

(2) M = unspecified magnitude, M_b = compressional body wave magnitude, M_c = primary coda magnitude, M_d = duration magnitude (also known as coda magnitude), M_L = local Richter magnitude, and MMI = Modified Mercalli Intensity at or near epicenter.

Seismic events in Oregon were not comprehensively documented until the 1840s (Wong and Bott, 1995). Earthquake epicenters located in Oregon from the late 1920s to 1962 were limited due to the number of and the distance between seismographs, the number of recording stations, and uncertainty in travel times. Therefore, information recorded during that time suggests only earthquakes with magnitudes >5 would be recorded in Oregon (Bela, 1979). Oregon State University (OSU) likely had the first station installed in 1946, and the first modern seismograph was installed at OSU in 1962 (Wong and Bott, 1995; Barnett et al., 2009).

According to Wong and Bott (1995), seismograph stations sensitive to smaller earthquakes ($M_L \leq 4$ to 5) were not implemented in northwestern Oregon until 1979 when the University of Washington expanded their seismograph network to Oregon. The local Richter magnitude (M_L) of events occurring before the establishment of seismograph stations have been estimated based on correlations between magnitude and MMI. Some discrepancy exists in the correlations.

Table 3D summarizes distant, strong earthquakes felt in the Reedsport area (Noson et al., 1988; Stover and Coffman, 1993; Dewey et al., 1994; Wong and Bott, 1995; Dewey et al., 2002). None of these events caused significant, reportable damage in Reedsport or the surrounding area.

Table 3D. Distant Earthquakes Felt in the Reedsport Area

Earthquake	Modified Mercalli Intensities (MMI)
2001 Nisqually, Washington	II to III
1993 Scotts Mills, Oregon	<III
1965 Seattle – Tacoma, Washington	I to IV
1949 Olympia, Washington	II to III
1873 Crescent City, California	V

Seismic and Geologic Hazards

Section 1803.6.1 of the OSSC 2019 and Section 8.2.2 of ASCE 41-17 require the evaluation of risks from a range of seismic hazards including landslides (slope stability), earthquake-induced landslides, liquefaction, lateral spread, seismic-induced settlement or subsidence, fault rupture, seiche, tsunami inundation, earthquake-induced flooding and inundation, and local ground motion amplification (ASCE/SEI, 2017; OSSC, 2019).

We have developed conclusions regarding the seismic hazards based on the subsurface profiles encountered in our explorations at the project site. The conclusions are also based on our knowledge of the site geology, a review of previous geotechnical investigations or well logs completed in the area, and available geologic hazard maps (including information available from DOGAMI).

DOGAMI has completed geologic and seismic hazard studies, which include Douglas County (Reedsport) (Madin and Wang, 1999), and provides online hazard information through HazVu, LiDAR, and SLIDO viewers (DOGAMI, 2018, 2020, 2021). The above-mentioned maps and references refer to some, but do not cover all, of the seismic hazards. The reviewed information is only considered a guide and does not have precedence over site-specific evaluations. In the following sections, information from the available seismic hazard maps is provided along with our site-specific evaluations for comparison.

The relative earthquake hazard is based on the combined effects of ground shaking amplification and earthquake-induced landslides with a range in hazard from Zone A (highest hazard) to Zone D (lowest hazard). Based on the DOGAMI mapping, the site is within Zone B (intermediate to high hazard) for the overall, relative earthquake hazard (Madin and Wang, 1999).

Landslides and Earthquake-Induced Landslides (Slope Stability). The site is located on a low-lying area of eastern Reedsport that is relatively flat and has been filled over historic times to accommodate development. There is no risk of a landslide or earthquake-induced landslide developing at the site due to the flat topography. However, there are existing mapped landslides along the hillside to the south (DOGAMI, 2018, 2020). DOGAMI indicates high landslide susceptibility along that hillside. We anticipate slope instability is likely during a large magnitude, long-duration earthquake. The facility is about 350 feet from the toe of the slope; therefore, the risk of being impacted by slope instability is expected to be low.

Liquefaction, Settlement, and Lateral Spread. Soil liquefaction occurs when loose, saturated cohesionless soil experiences a significant loss of strength during strong ground shaking. The strength loss is associated with rapid densification of the soil and corresponding development of high pore water pressure, which can lead to the soil behaving like a viscous fluid. Liquefiable soils typically consist of saturated, loose, clean sand and non-plastic to low plasticity silt with a plasticity index (PI) less than 8.

The recent exploration encountered loose sand (fill); very soft to soft, wet, high plasticity organic clayey silt; and soft, high plasticity clay. The upper soft soil extends to a depth of ±31.5 feet and is underlain by dense to very dense sandy gravel to ±61 feet. Deeper profile includes stiff clayey silt with some sand over weak (R1) sandstone. An estimated groundwater level of ±2.5 feet below the ground surface was determined based on a review of nearby well logs. The upper materials are expected to have a high liquefaction risk due to the low density of the fill and the consistency of the fine-grained soils. Therefore, we have concluded there is a high liquefaction hazard at the site. DOGAMI mapping also indicates a high liquefaction hazard (Madin and Wang, 1999; DOGAMI, 2018). Liquefaction analysis was completed and more discussion is in the main report.

Seismic-induced settlement may occur within the very soft organic deposits as well. We anticipate that this risk would result in variable settlement and extend throughout this portion of Reedsport, which includes fill over the very soft soils. Lateral spread is a liquefaction-induced hazard, which occurs when soil or blocks of soil are displaced down slope or toward a free face (such as a riverbank) along a liquefied layer. The lateral spread hazard at this site is considered low due to the lack of steep slopes and distance to a free face near the project site (Umpqua River is ±1,200 feet to the north-northeast).

Subsidence. Ground subsidence is a regional phenomenon resulting from a large magnitude CSZ earthquake. It occurs because the subduction of the oceanic crust beneath the continental crust compresses the continental crust and pushes it upward. Prior to the earthquake, the continental crust is held in this position by friction at the CSZ interface. When the earthquake occurs, that frictional bond breaks, allowing the continental crust to drop.

The subsidence hazard map included in the Oregon Resilience Plan (OSSPAC, 2013), indicates the ground subsidence in the Reedsport area during a M_w 9 CSZ earthquake could be up to 3 feet. Earthquake-induced regional ground subsidence on the ASCE 7-22 Tsunami Hazard Tool estimates ±7.15 feet for the site (ASCE, 2021). Ground subsidence cannot be mitigated.

Fault Rupture. The risk of fault rupture is expected to be low due to the lack of known active faulting beneath the site (Newton, 1980; Personius et al., 2003; USGS, 2006b, a). The closest potentially active (Class A) crustal faults are the unnamed offshore faults located ±18 miles west and southwest of the site (USGS, 2006b).

Tsunami. Tsunami are waves created by a large-scale displacement of the seafloor due to earthquakes, landslides, or volcanic eruptions (Priest, 1995). Generated waves move rapidly and may be due to either local or distant sources. Reedsport is located slightly inland on the Oregon Coast and is close to the CSZ and other distal seismogenic sources. Therefore, there is a potential for tsunami impacting the low-lying coastal areas, the adjacent coastline, and inland areas at Reedsport.

DOGAMI initially prepared tsunami inundation maps in 1995 for the Oregon coast to aid in the implementation of Senate Bill 379 (SB 379), which limits construction of new essential facilities and special occupancy structures within the tsunami inundation zone (Priest, 1995; Olmstead, 2003). The Reedsport Quadrangle 1995 was updated in 1997 and indicates all of Reedsport, including the site, are above the tsunami inundation line for a M 8.8 undersea earthquake (Priest, 1997).

These original tsunami maps were updated to include distinctions between tsunami caused by a local CSZ source earthquake and distant Alaskan source earthquake (Alaskan-Aleutian Island subduction zone) (DOGAMI, 2012). These updated maps were developed for residents and visitors to prepare for the next CSZ earthquake and tsunami including life safety and evacuation plans and assist local governments in determining the acceptable risk for certain land uses. In 2019, House Bill 3309 (HB 3309) was passed which permits previously restricted facilities within the tsunami inundation zone if DOGAMI is consulted and assists in determining impacts and risk mitigation methods at the site.

For purposes of discussing tsunami hazards, we refer to the most recent DOGAMI mapping, which the City of Reedsport has adopted the local source (CSZ) map as their Tsunami Hazard Overlay Zone, and results from the ASCE 7-22 Tsunami Hazard Tool. Discussions of the scenarios follow.

The DOGAMI local source (CSZ) tsunami inundation map includes scenarios ranging from small (S) to extra extra large (XXL) that are based on the tide when the tsunami wave occurs and with variable slip, frequency of occurrence, subsidence, and earthquake magnitude. The distant source includes the impact of an Alaskan M9.2 earthquake (replicating the 1964 event) and a hypothetical Alaskan maximum source tsunami (worse-case event, including uniform slip on one subfault) at high tide.

The site is outside the impact of the Alaskan-Aleutian subduction zone (distant source) earthquakes. However, the site is within the medium (M) tsunami inundation zone for a CSZ earthquake. The proposed facility is located above (or outside of) the SB 379 inundation line.

The ASCE 7-22 online Tsunami Hazard Tool indicates the site is at Elevation 34.5 feet, and therefore not within a Tsunami Design Zone. It appears the local elevations for the tool are not accurate, resulting in the discrepancy with the DOGAMI mapping.

There is potential risk of a tsunami impacting the Station 7 building because it is within the L to XXL tsunami zones for a CSZ earthquake. The proposed improvements are not intended to mitigate the tsunami hazard. Therefore, following a large tsunami, it will be necessary to evaluate the condition of the facility and make repairs, as needed. A tsunami is likely to occur relatively quickly (within ±15 to 20 minutes) following a local CSZ earthquake. Therefore, we recommend having an evacuation plan in place for the facility consistent with the DOGAMI evacuation map for Reedsport.

Seiche and Earthquake-Induced Flooding. A seiche is a resonant oscillation of water, typically occurring in an enclosed water body and created by earthquake ground motions or a combination of atmospheric conditions. Since there is no large body of water at or near the project site, seiche is not a hazard.

According to HazVu, there is no localized flood potential for the Effective FEMA 100-year flood at the site (DOGAMI, 2018). Earthquake-induced flooding related to the failure of other structures (e.g., dams) or shallow groundwater, and subsidence does not apply to the site.

Local Ground Motion Amplification. Ground motion amplification is the influence of a soil deposit on the earthquake motion. As seismic energy propagates up through the soil strata, the ground motion is typically increased (i.e., amplified) or decreased (i.e., attenuated) to some extent. Due to the site proximity to the CSZ, the site is expected to experience severe ground shaking during a large subduction zone earthquake (DOGAMI, 2018). Based on the presence of loose sand, very soft to soft organic clayey silt, and soft clay over very dense to dense sandy gravel with bedrock (sandstone) below ±77 feet; it is our opinion the amplification hazard is moderate to high and is consistent with an OSSC/IBC Site Class E (soft soil). The DOGAMI hazard study indicates a high amplification hazard for most of Reedsport except for areas directly underlain by bedrock (Madin and Wang, 1999). See the main report for more discussion on the design site response.

SEISMIC DESIGN

Design Earthquakes

The OSSC 2019, Section 1803.3.2.1, requires the design of structures classified as essential or hazardous facilities and of major and special occupancy structures to address, at a minimum, the following earthquakes:

Crustal: A shallow crustal earthquake on a real or assumed fault near the site with a minimum M_w 6.0 or the design earthquake ground motion acceleration determined in accordance with the OSSC 2019 Section 1613.

Intraslab: A CSZ intraslab earthquake with M_w of at least 7.0.

Interface: A CSZ interface earthquake with a M_w of at least 8.5.

The ASCE 41-17 response spectra used in the structural evaluation of the existing buildings are based on USGS 2014 risk-targeted ground motions with probabilities of exceedance ranging from 20% in 50 years (i.e., a ±225-year return period) to 5% in 50 years (i.e., a ±975-year return period). The risk targeted ground motions include factors to adjust the spectral accelerations to account for directivity and risk. The relative contribution of crustal earthquakes becomes greater for the shorter return periods.

The 2014 USGS maps were established based on probabilistic studies and include aggregate hazards from a variety of seismic sources. The interactive deaggregation search tool on the USGS National Earthquake Hazard Mapping website allows the breakdown of earthquake sources to be identified (USGS, 2014b). Interactive deaggregation for 225-year and 975-year return periods indicates the seismic hazard at the site is dominated by the CSZ (USGS, 2014b). The principal seismic sources comprising at least 5% of the overall hazard are summarized in Table 4D for the 225-year return period and in Table 5D for the 975-year return period.

Table 4D. Principal Seismic Sources based on USGS (2014b) Seismic Hazard Maps – 20% in 50 years (225-year return period)

Source	Mean Moment Magnitude, M_w	Mean Source-to-Site Distance, R (km)	Percent Contribution
CSZ Megathrust Interface	8.88	36.6	±21.8
CSZ Megathrust Interface	9.07	23.7	±13.1
CSZ Megathrust Interface	8.78	45.2	±8.7
Coastal OR Deep - Intraslab	N/A	N/A	±6.5

Table 5D. Principal Seismic Sources based on USGS (2014b) Seismic Hazard Maps – 5% in 50 years (975-year return period)

Source	Mean Moment Magnitude, M_w	Mean Source-to-Site Distance, R (km)	Percent Contribution
CSZ Megathrust Interface	8.89	36.6	±31.5
CSZ Megathrust Interface	9.08	23.7	±28.1
CSZ Megathrust Interface	8.80	45.2	±9.1

The earthquake magnitudes and source-to-site distances used to generate the 2014 USGS maps satisfy the requirements of OSSC 2019 and ASCE 41-17. Seismic design parameters and design response spectrum are discussed in the Site Response Spectrum section of the main report and are shown in Figure 3A (Appendix A).

CONCLUSION

Based on the findings presented herein, it is our opinion that there are a number of seismic hazards associated with this site. Some of these hazards such as strong shaking, ground subsidence, liquefaction, and tsunami inundation are inherent to the site location and low-lying elevation. The most significant seismic hazards at the site are associated with a large CSZ event (Megathrust Interface), which is expected to have significant impacts to the lower lying portion of Reedsport. We understand that the current project is not intended to mitigate this hazard. Rather, the improvements are intended to retrofit the structure to make it more capable of accommodating smaller crustal or distant, smaller CSZ events. Therefore, following a large magnitude earthquake, it should be assumed the condition of the structure will need to be evaluated and repairs may need to be made, as required.

This site-specific seismic hazard investigation for the Station 7 Seismic Evaluation in Reedsport, Oregon, was prepared by Brooke Running, R.G., C.E.G.

REFERENCES

Adams, J., 1990, *Paleoseismicity of the Cascadia Subduction Zone: Evidence from Turbidites Off the Oregon-Washington Margin*: Tectonics, vol. 9, no. 4, p. 569-583.

ASCE, 2021, *ASCE Tsunami Hazard Tool:* ASCE (American Society of Civil Engineers) ASCE/SEI 7-22, ASCE Tsunami Design Geodatabase Version 2022-1.0, updated December 2021, Risk Category IV, Site Soil Class D, accessed May 2022.

ASCE/SEI, 2017, *Seismic Evaluation and Upgrade of Existing Buildings - ASCE/SEI 41-17:* American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI).

Atwater, B. F., Carson, B., Griggs, G. B., Johnson, H. P., and Salmi, M. S., 2014, *Rethinking Turbidite Paleoseismology Along the Cascadia Subduction Zone*: Geology, published online 29 July 2014, doi: 10.1130/G35902.1.

Atwater, B. F., Nelson, A. R., Clague, J. J., Carver, G. A., Yamaguchi, D. K., Bobrowsky, P. T., Bourgeois, J., Darienzo, M. E., Grant, W. C., Hemphill-Haley, E., Kelsey, H. M., Jacoby, G. C., Nishenko, S. P., Palmer, S. P., Peterson, C. D., and Reinhart, M. A., 1995, *Summary of Coastal Geologic Evidence for Past Great Earthquakes at the Cascadia Subduction Zone*: Earthquake Spectra, vol. 11, no. 1, p. 1-18.

Atwater, T., 1970, *Implications of Plate Tectonics for the Cenozoic Tectonic Evolution of Western North America:* Geological Society of America (GSA), Bulletin 81, p. 3513-3536.

Barnett, E. A., Weaver, C. S., Meagher, K. L., Haugerud, R. A., Wang, Z., Madin, I. P., Yang, Y., Wells, R. E., Blakely, R. J., Ballantyne, D. B., and Darienzo, M., 2009, *Earthquake Hazards and Lifelines in the Interstate 5 Urban Corridor: Cottage Grove to Woodburn, Oregon:* US Geologic Survey (USGS), Scientific Investigations Map 3028, 1 Plate.

Beaulieu, J. D., and Hughes, P. W., 1975, *Environmental Geology of Western Coos and Douglas Counties, Oregon:* Oregon Department of Geology and Mineral Industries (DOGAMI), Bulletin 87, 147 p.

Bela, J. L., 1979, *Geologic Hazards of Eastern Benton County, Oregon:* Oregon Department of Geology and Mineral Industries (DOGAMI), Bulletin 98, 122 p.

DeMets, C., Gordon, R. G., and Argus, D. F., 2010, *Geologically Current Plate Motions:* Geophysical Journal International, vol. 181, no. 1, p. 1-80.

Dewey, J. W., Hopper, M. G., Wald, D. J., Quitoriano, V., and Adams, E. R., 2002, *Intensity Distribution and Isoseismal Maps for the Nisqually, Washington, Earthquake of 28 February 2001:* U.S. Geological Survey (USGS), Open-File Report 02-346, 57 p.

Dewey, J. W., Reagor, B. G., Johnson, D., Choy, G. L., and Baldwin, F., 1994, *The Scotts Mills, Oregon, Earthquake of March 25, 1993: Intensities, Strong-motion Data, and Teleseismic Data:* U.S. Geological Survey (USGS), OFR 94-163, 26 p.

DOGAMI, 2012, *Tsunami Inundation Maps - Reedsport, Douglas County, Oregon, Local Source (Cascadia Subduction Zone) and Distant Source (Alaskan-Aleutian Subduction Zone):* Oregon Department of Geology and Mineral Industries (DOGAMI), TIM-Doug04, Scale = 1:12,000.

DOGAMI, 2018, *Statewide Geohazards Viewer (Oregon HazVu)* Oregon Department of Geology and Mineral Industries (DOGAMI), website: http://www.oregongeology.org/hazvu, updated March 13, 2018, accessed May 2022.

DOGAMI, 2020, *Statewide Landslide Information Database for Oregon (SLIDO version 4.4):* Oregon Department of Geology and Mineral Industries (DOGAMI), website: https://www.oregongeology.org/slido/data.htm, updated October 29, 2021, accessed May 2022.

DOGAMI, 2021, *Light Detection and Ranging (LiDAR) Viewer:* Oregon Department of Geology and Mineral Industries (DOGAMI), website: https://www.oregongeology.org/lidar/index.htm, last updated April 2021, accessed May 2022.

Geomatrix Consultants, 1995, *Final Report: Seismic Design Mapping, State of Oregon:* Prepared for Oregon Department of Transportation, Salem, Oregon, Personal Services Contract 11688, January 1995, Project No. 2442.

Goldfinger, C., Galer, S., Beeson, J., Hamilton, T., Black, B., Romsos, C., Patton, J., Nelson, C. H., Hausmann, R., and Morey, A., 2016, *The Importance of Site Selection, Sediment Supply, and Hydrodynamics: A Case Study of Submarine Paleoseismology on the Northern Cascadia Margin, Washington, USA:* Marine Geology, website: http://dx.doi.org/10.1016/j.margeo.2016.06.008.

Goldfinger, C., Nelson, C. H., Morey, A. E., Johnson, J. R., Patton, J., Karabanov, E., Gutierrez-Pastor, J., Eriksson, A. T., Gracia, E., Dunhill, G., Enkin, R. J., Dallimore, A., and Vallier, T., 2012, *Turbidite Event History - Methods and Implications for Holocene Paleoseismicity of the Cascade Subduction Zone:* U.S. Geologic Survey (USGS), Professional Paper 1661-F, 170 p., 64 figures, website: http://pubs.usgs.gov/pp/pp1661/f.

Johnson, A. G., Scofield, D. H., and Madin, I. P., 1994, *Earthquake Database for Oregon, 1833 Through October 25, 1993:* Oregon Department of Geology and Mineral Industries (DOGAMI), Open-File Report O-94-04.

Madin, I. P., and Wang, Z., 1999, *Relative Earthquake Hazard Maps for Selected Coastal Communities in Oregon: Astoria-Warrenton, Brookings, Coquille, Florence-Dunes City, Lincoln City, Newport, Reedsport-Winchester Bay, Seaside-Gearhart-Cannon Beach, Tillamook:* Oregon Department of Geology and Mineral Industries (DOGAMI), IMS-10, 25 p.

NCEDC, 2014, *Advanced National Seismic System (ANSS) Composite Historic Catalog:* Northern California Earthquake Data Center (NCEDC), UC Berkeley Seismological Laboratory, 50 mile radius, dataset 1898-2012, accessed May 2022, doi: 10.7932/NCEDC, http://www.ncedc.org/anss/catalog-search.html.

Nelson, A. R., Atwater, B. F., Bobrowsky, P. T., Bradley, L.-A., Claque, J. J., Carver, G. A., Darienzo, M. E., Grant, W. C., Drueger, H. W., Sparks, R., Stafford, T. W., Jr., and Stulver, M., 1995, *Radiocarbon Evidence for Extensive Plate-boundary Rupture About 300 Years Ago at the Cascadia Subduction Zone*: Letters to Nature, vol. 378, no. 23, p. 372-374.

Newton, V. C., Jr., 1980, *Prospects for Oil and Gas in the Coos Basin, Western Coos, Douglas, and Lane Counties, Oregon:* Oregon Department of Geology and Mineral Industries (DOGAMI), Oil and Gas Investigation No. 6, p. 74.

Noson, L. L., Qamar, A., and Thorsen, G. W., 1988, *Washington Earthquake Hazards:* Washington Department of Natural Resources (WADNR), Division of Geology and Earth Resources, Olympia, Washington, 77 p.

Olmstead, D., 2003, *Development in Oregon's Tsunami Inundation Zone: Information Guide for Developers and Local Government:* Oregon Department of Geology and Mineral Industries (DOGAMI), Open-File Report OFR-03-05, p. 17 p.

Orr, E. L., and Orr, W. N., 1999, *Geology of Oregon*, Kendall/Hunt Publishing Company, Fifth Edition, 254 p.

OSSC, 2019, *Oregon Structural Speciality Code (OSSC):* Based on the International Code Council, Inc., 2018 International Building Code (IBC), Sections 1613 and 1803.

OSSPAC, 2013, *The Oregon Resilience Plan - Cascadia: Oregon's Greatest Natural Threat:* Oregon Seismic Safety Policy Advisory Commission (OSSPAC), February 2013.

Palmer, A. R., 1983, *The Decade of North American Geology - 1983 Geologic Time Scale:* Geology, vol. 11, p. 503-504, September 1983.

Personius, S. F., Dart, R. L., Bradley, L.-A., and Haller, K. M., 2003, *Map and Data for Quaternary Faults and Folds in Oregon:* U.S. Geological Survey (USGS), Open-File Report 03-095, v.1.1, Scale: 1:750,000, 507 p.

Personius, S. F., and Nelson, A. R., 2006, *Fault Number 781, Cascadia Megathrust, in Quaternary Fault and Fold Database of the United States:* U.S. Geological Survey (USGS), website: https://earthquakes.usgs.gov/hazards/qfaults.

Petersen, M. D., Moschetti, M. P., Powers, P. M., Mueller, C. S., Haller, K. M., Frankel, A. D., Zeng, Y., Rezaeian, S., Harmsen, S. C., Boyd, O. S., Field, N., Chen, R., Rukstales, K. S., Luco, N., Wheeler, R. L., Williams, R. A., and Olsen, A. H., 2014, *Documentation for the 2014 Update of the United States National Seismic Hazard Maps:* U. S. Geological Survey (USGS), Open-File Report 2014-1091, 243 p., website: https://pubs.usgs.gov/of/2014/1091/.

Peterson, C. D., Darienzo, M. E., Burns, S. F., and Burris, W. K., 1993, *Field Trip Guide to Cascadia Paleoseismic Evidence Along the Northern Oregon Coast: Evidence of Subduction Zone Seismicity in the Central Cascadia Margin*: Oregon Geology, vol. 55, no. 5, p. 99-114.

Priest, G., 1995, *Explanation of Mapping Methods and Use of the Tsunami Hazard Maps of the Oregon Coast:* Oregon Department of Geology and Mineral Industries (DOGAMI), Open File Report O-95-67, p. 95 p.

Priest, G. R., 1997, *Tsunami Hazard Map of Reedsport Quadrangle, Douglas County:* Oregon Department of Geology and Mineral Industries (DOGAMI), Open-File Report O-97-32, supersedes O-95-41, and superseded by digital reissue O-00-05, Scale = 1:24,000.

Satake, K., Shimazaki, K., Tsuji, Y., and Ueda, K., 1996, *Time and Size of a Giant Earthquake in Cascadia Inferred from Japanese Tsunami Records of January 1700*: Nature, vol. 379, no. 6562, p. 246-249.

Stover, C. W., and Coffman, J. L., 1993, *Seismicity of the United States, 1568-1989:* U.S. Geological Survey (USGS), Abridged from USGS Professional Paper 1527, April 2006, website: http://earthquake.usgs.gov/regional/states/events/1949_04_13_iso.php.

USGS, 2006a, *Quaternary Fault and Fold Database for the United States - Oregon:* U.S. Geological Survey (USGS), reference material has no specific release date, accessed May 2022, website: https://earthquake.usgs.gov/cfusion/qfault/.

USGS, 2006b, *Quaternary Fault and Fold Database of the United States - Interactive Fault Map:* U.S. Geological Survey (USGS), reference material has no specific release date, accessed May 2022, website: https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=5a6038b3a1684561a9b0aadf88412fcf.

USGS, 2013, *ANSS Comprehensive Earthquake Catalog (ComCat):* U.S. Geological Survey (USGS), Conterminous U.S., 80 km (49.7 mi) radius earthquake circle search, shake maps accessed May 2022, website: https://earthquake.usgs.gov/earthquakes/search/.

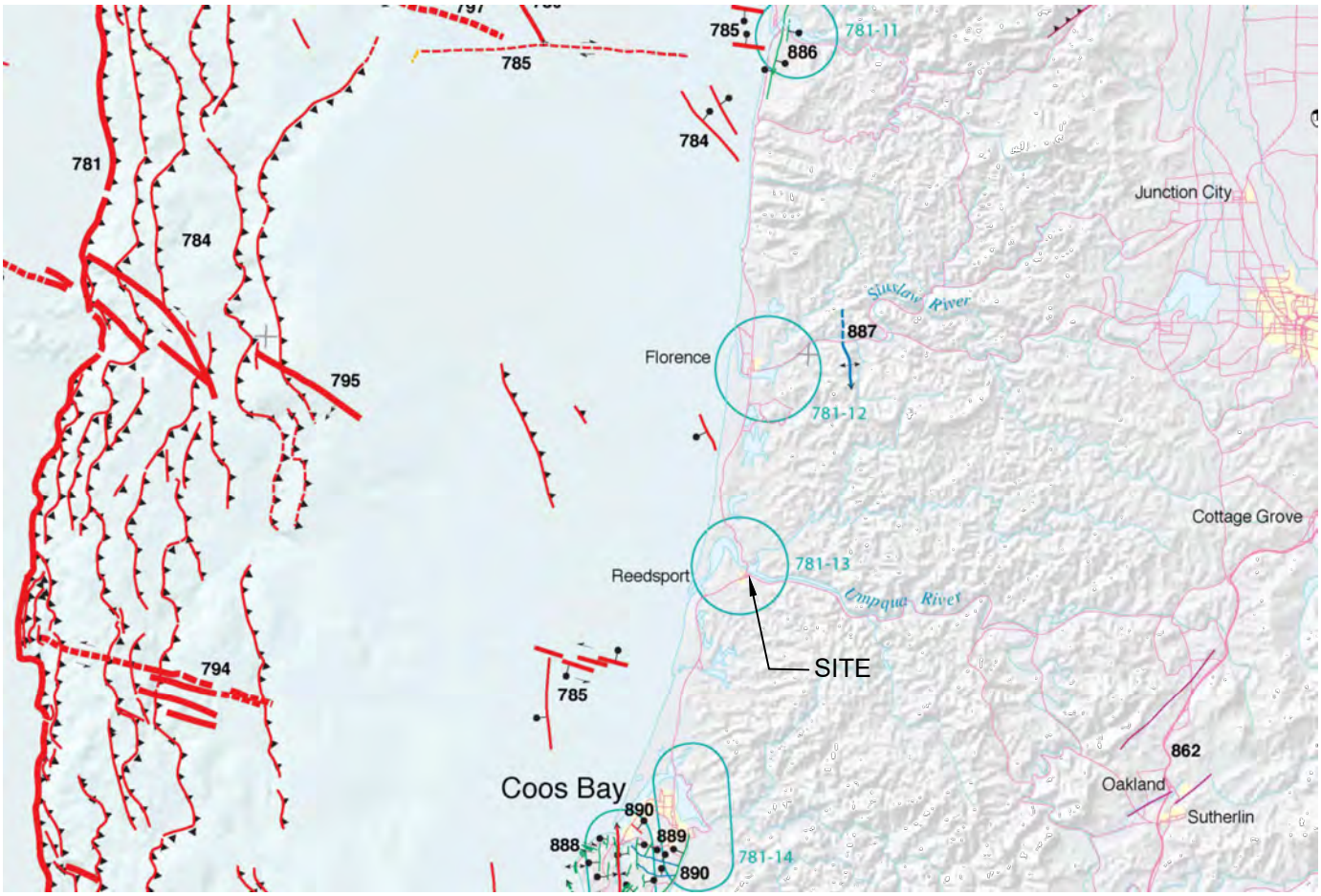
USGS, 2014a, *2014 National Seismic Hazard Maps -Source Parameters - Spatial Query:* U.S. Geological Survey (USGS), accessed May 2022, website: http://geohazards.usgs.gov/cfusion/hazfaults_2014_search/query_main.cfm.

USGS, 2014b, *Earthquake Hazards Program, Interactive Deaggregations, Dynamic Conterminous U.S. 2014 (v.4.2.0):* US Geological Survey (USGS), 20% in 50 years return period (225 years) and 5% in 50 years return period (975 years) PGA spectral acceleration, latitude/longitude search, reference material has no specific release date, accessed May 2022, website: https://earthquake.usgs.gov/hazards/interactive/index.php.

Weaver, C. S., and Shedlock, K. M., 1996, *Estimates of Seismic Source Regions from the Earthquake Distribution and Regional Tectonics in the Pacific Northwest*: *in* Roger, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., eds., *Assessing Earthquake Hazards and Reducing Risk in the Pacific Northwest*, U.S. Geological Survey (USGS), Professional Paper 1560, vol. 1, p. 285-306.

Wong, I. G., and Bott, J. D. J., 1995, *A Look Back at Oregon's Earthquake History, 1841-1994*: Oregon Geology, vol. 57, no. 6, p. 125-139.

Wong, I. G., and Silva, W. J., 1998, *Earthquake Ground Shaking Hazards in the Portland and Seattle Metropolitan Areas*: *in* Dakoulas, P., Yegian, M., and Holtz, R. D., eds., *Geotechnical Earthquake Engineering and Soil Dynamics III*, American Society of Civil Engineers (ASCE), Geotechnical Special Publication vol. 1, no. 75, p. 66-78.



NOTES:

1. PORTION OF MAP BASED ON MAP OF QUATERNARY FAULTS AND FOLDS IN OREGON (PERSONIUS ET AL., 2003).
2. SEE SITE-SPECIFIC SEISMIC HAZARD STUDY FOR A DISCUSSION OF LOCAL FAULTING.
3. FAULTS: #784 = CASCADIA FOLD AND FAULT BELT; #785 = UNNAMED OFFSHORE; #794 = COOS BASIN; #795 = HECETA BANK STRUCTURE; #862 = UNNAMED FAULTS NEAR SUTHERLIN; #886 = WALDPORT; #887 = UNNAMED SIUSLAW RIVER ANTICLINE; #888 = SUNSET BAY-CAPE ARAGO FOLDS AND FAULTS; #889 = EAST SOUTH SLOUGH; #890 = SOUTH SLOUGH THRUST AND REVERSE; #891 = SOUTH SLOUGH SYNCLINE; #892 = PIONEER ANTICLINE; AND #893 = COQUILLE ANTICLINE.
4. MAP IS NOT TO SCALE.

MAP LEGEND:

TIME OF MOST RECENT SURFACE RUPTURE
- Holocene (<10,000 years) or post last glaciation (<15,000 years); no historic ruptures in Oregon to date
- Late Quaternary (<130,000 years; post penultimate glaciation)
- Late and middle Quaternary (<750,000 years)
- Quaternary, undifferentiated (<1,600,000 years)
- Class B structure (age or origin uncertain)

SLIP RATE
- >5mm/year
- 1.0-5.0 mm/year
- 0.2-1.0 mm/year
- <0.2mm/year

TRACE
- Mostly continuous at map scale
- Mostly discontinuous at map scale
- Inferred or concealed

STRUCTURE TYPE & RELATED FEATURES
- Normal or high-angle reverse fault
- Strike-slip fault
- Thrust fault
- Anticlinal fold
- Synclinal fold
- Monoclinal fold
- Plunge direction of fold
- Fault section marker

CULTURAL AND GEOGRAPHIC FEATURES
- Divided highway
- Primary or secondary road
- Permanent river or stream
- Intermittent river or stream
- Permanent or intermittent lake

DETAILED STUDY SITES
- 731-2 Trench site
- 781-2 Subsuction zone study site

Foundation Engineering, Inc.
Professional Geotechnical Services

QUARTERNARY CRUSTAL FAULT MAP

FIGURE NO. 1D

PROJECT NO.	DATE:	DRAWN BY:
2221038	May. 16, 2022	BKR

STATION 7 SEISMIC EVALUATION
REEDSPORT, OREGON

APPENDIX C

EXISTING HAZARDOUS MATERIALS REPORT

ARCADIA
ENVIRONMENTAL

ZCS Engineering, Inc.
Attn: Matthew Crawford
524 Main St, Ste 2
Oregon City, OR 97405

February 9, 2022

Re: AE 21121540 Reedsport Station #7 asbestos & Lead building inspection.

You contracted Arcadia Environmental for the asbestos and lead inspection of the fire/police station located at 124 N 4th St, Reedsport, OR 97467. The inspection was conducted on 20 January 2022 by Ken Newman, an AHERA certified asbestos building inspector. This inspection was performed in preparation for seismic retrofitting.

The building is a combined fire station and police station, all of the building was inspected with the exception of the jail cells. This is a 2-story structure with a partial attic. The roof is a new 3-tab Asphalt shingle roof, the siding is mixed cinder block and lap siding. The building sits on concrete slab foundation. the fire hall side of the building has a full second story. The second story has drop ceiling with wood fiber tiles in metal grid, sheet rock walls in the restroom, plywood and block in the rest of the area. The floors are tile on wood and the windows are mixed glass block and steel frame tilt out windows with putty to secure the glass in place. The main floor of the fire station has mixed block and plywood walls, concrete floors with limited paint on the floors. The boiler room has been converted to hot water heater and no boiler.

The police station has been updated considerably compared to the fire department spaces. The walls and ceilings are sheet rock with new areas and walls installed over the years. The floors are mixed sheet vinyl, carpeting and vinyl plank. Areas inspected found older flooring materials under the carpets. Thermal Systems Insulation on Piping was discovered in the conference room closet and extending above the drop ceiling. There is original roofing material located in an attic space above the police department that will require attention.

The paint in the building was also discussed, samples were taken from the red interior paint and the exterior trim and Garage doors. The exterior field paint on the siding of the building is of a similar color to the garage doors, however, it is adhering to the structure and does not exhibit the same qualities of the paint on the garage doors and is not suspect for lead-based paint.

The survey was conducted according to EPA regulations in CFR 763. Subpart E and OSHA standards 29 CFR 1910 and 29 CFR 1926. No walls, ceilings or floors were penetrated to assess areas not visible during a normal inspection. No inaccessible areas were breached during this inspection unless otherwise noted. The inspection follows the AHERA guidelines for material description only, samples taken are based on the inspector's experience, OSHA guidelines and general protocols. The ACM (asbestos containing materials) classifications are SM (surfacing materials) TSI (thermal systems insulation) and MBM (miscellaneous building materials), their conditions will be described and they will be characterized as Friable or Non-friable, any volumes

3164 Ocean Blvd SE, PO Box 1290
Coos Bay OR 97420
541-808-3880
Oregon CCB # LBPR 211305

will be estimates only and not recommended for bidding purposes. All samples were sent to a NVLAP (national voluntary laboratory accreditation program) Laboratory for analysis. Bulk samples were analyzed by method PLM EPA 600/R-93/116.

15 Asbestos samples were taken from the building during the inspection from the interior for analysis.

Sample #	Description	Condition	ACM %	Friable/NON
TRFT 1	Fire Hall Training Room Floor Tile w/Black Mastic			
	- Brown Tile	Good	2% Chrysotile	Friable
	- Black Mastic	Good	Non-detect	N/A
TRCT 2	Training Room Ceiling Tile			
	- Brown Tile	Good	Non-detect	N/A
KCT 3	Kitchen (bar) Ceiling Tile			
	- Brown Tile	Good	Non-detect	N/A
USTB 4	Upstairs Toeboard & Mastic			
	- Black Board	Good	Non-detect	N/A
	- Tan Mastic			
WP 5	Upstairs Window Putty			
	- White Putty	Good	Non-detect	N/A
BSR 6	Upstairs Bathroom Sheetrock & Texture			
	- Grey Sheetrock	Good	Non-detect	N/A
	- White Texture	Good	3% Chrysotile	Friable
ERFS 7	Evidence Room Floor Sheeting (& armory)			
	- Brown Sheeting	Good	20% Chrysotile	Friable
OWSR 8	Office Wall Sheetrock			
	- Grey Sheetrock	Good	Non-detect	N/A
BRFS 9	Break Room Floor Sheeting (under carpet)			
	- Grey Sheeting	Good	20% Chrysotile	Friable
BRTBM 10	Break Room Toeboard Mastic			
	- White Mastic	Good	Non-detect	N/A
BRSR 11	Break Room Sheetrock			
	- Grey Sheetrock	Good	Non-detect	N/A
DCT 12	Drop Ceiling Tile (in metal grid)			
	- White Tile	Good	Non-detect	N/A
PI 13	Pipe Insulation (against wall)			
	- Grey Insulation	Good	5% Chrysotile	Friable
PJI 14	Pipe Joint Insulation			
	- Grey Insulation	Good	5% Chrysotile	Friable
R 15	Roofing Material in Attic			
	- Black Tar	Good	4% Chrysotile	Non-friable
	- Brown Shingle	Good	Non-detect	N/A
	- White Shingle	Good	Non-detect	N/A

Lead Paint

3 Lead samples were taken from the building during the inspection from the exterior and interior for analysis.

Samples #	Location	% By weight	Lead
OTP 51	Outside Trim Paint	<0.173 %	NO
RIP 52	Red Interior Trim/Door Paint	2.251 %	YES
GDEP 53	Garage Door Exterior Paint	11.670 %	YES

Lead Exposure Limits
Paint
0.5% by weigh HUD definition of lead-based paint
1.0 mg/cm2
5000 ppm

The Lead sample results indicate the outside trim paint is Non-Lead Based Paint, However, the Red Interior trim and door paint and the exterior paint on the garage doors is Lead Based Paint, this is the same paint that is located on the majority of the exterior of the building. All of the light tan exterior paint is considered Lead based and must be removed by a Lead Certified contractor.

Site Photos

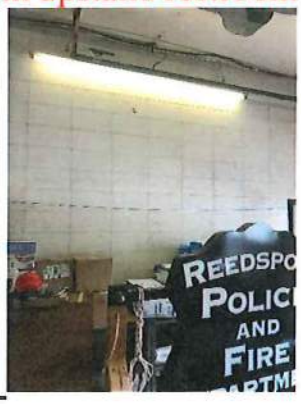
ACM tile

ACM tile




ACM wall texture in upstairs restroom





Lead Based Paint

ACM Sheet vinyl




ACM Sheet Vinyl

ACM Pipe TSI

ACM Pipe TSI

ACM floor sheeting (breakroom) under carpet

ACM Roofing Tar

Lead Based Paint (roll-up doors)


Lead Based Paint (doors)

The building is an older structure with various Asbestos Containing Material and Lead Based Paint, there were a number of suspect materials that did not have any issues that were tested, one of those areas was the block walls. The wall between the truck bay and the police department was penetrated to look for Vermiculite Insulation, none was found. As with any building of this age there may be hidden materials located in walls, ceilings and voids that are inaccessible until the work begins. If there are any suspect materials discovered all work must stop until a licensed asbestos building inspector is contacted for identification and disposition of the materials.

If any questions or concerns arise regarding this report, please feel free to contact our office for clarification.

Inspector:	Ken Newman, AHERA/ASHERA Inspector # IMR 19-4997B Arcadia Environmental Inc. OR CCB LBPR 211305 PO Box 1290 Coos Bay OR 97420 541-808-3880/541-260-4790
Laboratory:	SanAir Technologies Laboratory 1551 Oakbridge Drive, Suite B Powhatan, VA 23139 804-897-1177
Structure:	124 N 4th St Reedsport, OR 97467
Customer:	ZCS Engineering, Inc. Attn: Matthew Crawford 524 Main St, Ste 2 Oregon City, OR 97405 503-659-2205
Dates:	Inspection, 31 January 2022 Report, 09 February 2022

Respectfully,

Ken Newman
AHERA/ASHERA Inspector
Arcadia Environmental Inc

THIS IS TO CERTIFY THAT

KEN NEWMAN

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ASBESTOS INSPECTOR / MANAGEMENT PLANNER REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 03/19/2020

Course Location: Portland, OR

Certificate: IMR-20-4997B

PBS

AHERA is the Asbestos Hazard Emergency Response Act enacting Title II of Toxic Substance Control Act (TSCA)

Expiration Date: 03/19/2021

For verification of the authenticity of this certificate contact:
PBS Environmental
4412 SW Corbett Avenue
Portland, OR 97239
(503) 248-1939

Andy Fridley, Instructor

AE 21121540, 124 N 4th St, Reedsport, OR 97467

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Arcadia Environmental Inc.

Report Date: 2/2/2022

Project Name: Reedsport Fire Station #7

Project #: AE21121540

SanAir ID#: 22004647

NVLAP TESTING

NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com

SanAir ID Number
22004647
FINAL REPORT
2/2/2022 2:21:33 PM

Name: Arcadia Environmental Inc.
Address: P.O. Box 1290
Coos Bay, OR 97420
Phone: 541-808-3880

Project Number: AE21121540
P.O. Number:
Project Name: Reedsport Fire Station #7
Collected Date: 1/31/2022
Received Date: 2/1/2022 10:00:00 AM

Dear Ken Newman,

We at SanAir would like to thank you for the work you recently submitted. The 15 sample(s) were received on Tuesday, February 01, 2022 via UPS. The final report(s) is enclosed for the following sample(s): TRFT 1, TRCT 2, KCT 3, USTB 4, WP 5, BSR 6, ERFS 7, OWSR 8, BRFS 9, BRTBM 10, BRSR 11, DCT 12, PI 13, PJI 14, R 15.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 15 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
22004647
FINAL REPORT
2/2/2022 2:21:33 PM

Name: Arcadia Environmental Inc.
Address: P.O. Box 1290
Coos Bay, OR 97420
Phone: 541-808-3880

Project Number: AE21121540
P.O. Number:
Project Name: Reedsport Fire Station #7
Collected Date: 1/31/2022
Received Date: 2/1/2022 10:00:00 AM

Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic Appearance	Components % Fibrous	% Non-fibrous	Asbestos Fibers
TRFT 1 / 22004647-001 Fire Hall Training Room Floor Tile With Mastic, Floor Tile	Brown Non-Fibrous Homogeneous		98% Other	2% Chrysotile
TRFT 1 / 22004647-001 Fire Hall Training Room Floor Tile With Mastic, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
TRCT 2 / 22004647-002 Training Room Ceiling Tile	Brown Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
KCT 3 / 22004647-003 Kitchen (Bar) Ceiling Tile	Brown Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
USTB 4 / 22004647-004 Upstairs Toe Board & Mastic, Toe Board	Black Non-Fibrous Homogeneous		100% Other	None Detected
USTB 4 / 22004647-004 Upstairs Toe Board & Mastic, Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
WP 5 / 22004647-005 Upstairs Window Putty	White Non-Fibrous Homogeneous		100% Other	None Detected
BSR 6 / 22004647-006 Upstairs Bathroom Sheet Rock & Texture, Sheetrock	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
BSR 6 / 22004647-006 Upstairs Bathroom Sheet Rock & Texture, Texture	White Non-Fibrous Homogeneous		97% Other	3% Chrysotile
ERFS 7 / 22004647-007 Evidence Room Floor Sheeting (& Armory)	Brown Non-Fibrous Homogeneous		80% Other	20% Chrysotile

Analyst: Nik Lil

Approved Signatory: Matt

Analysis Date: 2/2/2022

Date: 2/2/2022

SanAir
Technologies Laboratory

SanAir ID Number
22004647
FINAL REPORT
2/2/2022 2:21:33 PM

Name: Arcadia Environmental Inc.
Address: P.O. Box 1290
Coos Bay, OR 97420
Phone: 541-808-3880

Project Number: AE21121540
P.O. Number:
Project Name: Reedsport Fire Station #7
Collected Date: 1/31/2022
Received Date: 2/1/2022 10:00:00 AM

Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic Appearance	Components % Fibrous	% Non-fibrous	Asbestos Fibers
OWSR 8 / 22004647-008 Orfice Wall Sheet Rock	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
BRFS 9 / 22004647-009 Break Room Floor Sheeting (Under Carpet)	Grey Non-Fibrous Homogeneous		80% Other	20% Chrysotile
BRTBM 10 / 22004647-010 Break Room Toe Board Mastic	White Non-Fibrous Homogeneous		100% Other	None Detected
BRSR 11 / 22004647-011 Break Room Sheet Rock	Grey Non-Fibrous Homogeneous		100% Other	None Detected
DCT 12 / 22004647-012 Drop Ceiling Tile (In Metal Grid)	White Fibrous Homogeneous	60% Cellulose 30% Min. Wool	10% Other	None Detected
PI 13 / 22004647-013 Pipe Insulation (Against Wall)	Grey Non-Fibrous Homogeneous	30% Min. Wool	65% Other	5% Chrysotile
PJI 14 / 22004647-014 Pipe Joint Insulation	Grey Non-Fibrous Homogeneous	30% Min. Wool	65% Other	5% Chrysotile
R 15 / 22004647-015 Roofing Material In Attic, Tar	Black Non-Fibrous Heterogeneous		96% Other	4% Chrysotile
R 15 / 22004647-015 Roofing Material In Attic, Shingle	Brown Non-Fibrous Heterogeneous		100% Other	None Detected
R 15 / 22004647-015 Roofing Material In Attic, Shingle	White Non-Fibrous Heterogeneous		100% Other	None Detected

Analyst: Nick Lil

Approved Signatory: Matt Smith

Analysis Date: 2/2/2022

Date: 2/2/2022

Disclaimer

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, po number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted on the report. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute and shall not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any other U.S. governmental agencies and may not be certified by every local, state, and federal regulatory agencies.

Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations.

For NY state samples, method EPA 600/M4-82-020 is performed.

NYELAP Disclaimer:
Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Certifications
NVLAP lab code 200870-0
City of Philadelphia: ALL-460
PA Department of Environmental Protection Number: 68-05397
California License Number: 2915
Colorado License Number: AL-23143
Connecticut License Number: PH-0105
Massachusetts License Number: AA000222
Maine License Number: LB-0075, LA-0084
New York ELAP lab ID: 11983
Rhode Island License Number: PCM00126, PLM00126, TEM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia 3333000323
Washington State License Number: C989
West Virginia License Number: LT000616
Vermont License: AL166318
Louisiana Department of Environmental Quality: 212253, Cert 05088

Revision Date: 8/14/2020

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B - Powhatan, VA 23139
804-897-1177 / 888-895-1177 / Fax 804-897-0070
www.sanair.com

Asbestos
Chain of Custody

SanAir ID Number: 22004647

Company: Arcadia Environmental Inc. #2912	Project #: AE 21121540	Phone #: 541-808-3880
Address: PO Box 1290	Project Name: Reedsport Fire Station #7	Phone #: 541-404-9919
City, St., Zip: Coos Bay OR 97420	Date Collected 1/31/2022	Fax #: 541-808-3169
Samples Collected By: Ken Newman	P.O. Number:	Email: ken@arcadiaenv.com

Asbestos Analysis Types

Bulk			Air			Soil/Vermiculite		
ABB	PLM EPA 600/R-93/116	X	ABA	PCM NIOSH 7400	☐	ABSE	PLM EPA 600/R-93/116 (Qual.)	☐
	Positive Stop ☐		ABA-2	OSHA w/ TWA*	☐	ABSP	PLM CARB 435 (LOD <1%)	☐
ABEPA	PLM EPA 400 Point Count	☐	ABTEM	TEM AHERA	☐	ABSP1	PLM CARB 435 (LOD 0.25%)	☐
ABB1K	PLM EPA 1000 Point Count	☐	ABATN	TEM NIOSH 7402	☐	ABSP2	PLM CARB 435 (LOD 0.1%)	☐
	PLM EPA NOB	☐	ABT2	TEM Level II	☐			
ABBCH	TEM Chatfield	☐						
ABBTM	TEM EPA NOB	☐		**Water**			**Dust**	
ABBNY	TEM NY ELAP 198.4	☐	ABHE	EPA 100.2	☐	ABWA	TEM Wipe ASTM D-6480	☐
OTHER/ Matrix :		☐				ABDMV	TEM Microvac ASTM D-5755	☐

Turn Around Times	3 HR (4 HR TEM)	6 HR (8HR TEM)	12 HR ☐	24 HR XX
	2 Days ☐	3 Days ☐	4 Days ☐	5 Days ☐

Sample #	Sample Identification/Location	Volume or Area	Sample Type	Flow Rate*	Time* Start – Stop	
TRFT 1	fire Hall training room floor tile with black mastic					
TRCT 2	Training room Ceiling tile					
KCT 3	Kitchen (bar) ceiling tile					
USTB 4	Upstairs Toe board & mastic					
WP 5	Upstairs window putty					
BSR 6	Upstairs bathroom sheet rock & texture					
ERFS 7	Evidence Room floor sheeting (& armory)					
OWSR 8	Office wall sheet rock					
BRFS 9	Break room floor sheeting (under carpet)					
BRTBM 10	Break room toe board mastic					
BRSR 11	Break room sheet rock					
DCT 12	Drop Ceiling tile (in metal grid)					

Special Instructions

Relinquished by	Date	Time	Received by	Date	Time
[signature]	01/31/22	1300	[signature]	2/1/22	10:00 am

Unless scheduled, the turn around time for all samples received after 5 pm Friday will begin at 8 am Monday morning.
Weekend or Holiday work must be scheduled ahead of time and is charged for rush turn around time.
Work with standard turn around time sent Priority Overnight and Billed To Recipient will be charged a $10 shipping fee.

22004647

Turn Around Times	3 HR (4 HR TEM) ☐	6 HR (8HR TEM)	12 HR ☐	24 HR XX
	2 Days ☐	3 Days ☐	4 Days ☐	5 Days ☐

Sample #	Sample Identification/Location	Volume or Area	Sample Type	Flow Rate*	Time* Start – Stop	
PI 13	Pipe insulation (against wall)					
PJI 14	Pipe Joint Insulation					
R 15	Roofing material in attic					

Special Instructions	

Relinquished by	Date	Time	Received by	Date	Time
	1/31/2022	1300	[illegible]	[illegible]	[illegible]

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Arcadia Environmental Inc.

Report Date: 2/8/2022

Project Name: Reedsport Fire Station #7

Project #: AE 21121540

SanAir ID#: 22004757

Lab ID # 162952

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com

SanAir
Technologies Laboratory

SanAir ID Number
22004757
FINAL REPORT
2/8/2022 4:03:51 PM

Name: Arcadia Environmental Inc.
Address: P.O. Box 1290
Coos Bay, OR 97420
Phone: 541-808-3880

Project Number: AE 21121540
P.O. Number:
Project Name: Reedsport Fire Station #7
Collected Date: 1/31/2022
Received Date: 2/1/2022 10:00:00 AM

Dear Ken Newman,

We at SanAir would like to thank you for the work you recently submitted. The 3 sample(s) were received on Tuesday, February 01, 2022 via UPS. The final report(s) is enclosed for the following sample(s): OTP 51, RIP 52, GDEP 53.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Abisola Kasali
Metals Laboratory Director
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis on Test Family AA
- Disclaimers and Additional Information

Sample conditions:
- 3 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
22004757
FINAL REPORT
2/8/2022 4:03:51 PM

Name: Arcadia Environmental Inc.
Address: P.O. Box 1290
Coos Bay, OR 97420
Phone: 541-808-3880

Project Number: AE 21121540
P.O. Number:
Project Name: Reedsport Fire Station #7
Collected Date: 1/31/2022
Received Date: 2/1/2022 10:00:00 AM

Analyst: Baird, Marti
Test Method: SW846/M3050B/7000B

Lead Paint Analysis

PAINT Sample	Description	µg Pb In Sample	Sample Size (grams)	Calculated RL	Sample Results	Sample Results
22004757 - 1	OTP 51	212	0.1223	81.8	1729	0.173 %
	Outside Trim Paint				µg/g (ppm)	By Weight
22004757 - 2	RIP 52	2319	0.103	97.1	22510	2.251 %
	Red Interior Trim/Door Paint				µg/g (ppm)	By Weight
22004757 - 3	GDEP 53	12920	0.1107	90.3	116700	11.670 %
	Garage Door Exterior Paint				µg/g (ppm)	By Weight

Method Reporting Limit <10 µg/0.1 g paint
Sample GDEP 53 matrix spike failed.

Signature: Marti Hibard
Date: 2/2/2022

Reviewed: Alissa Galbraith
Date: 2/2/2022

Disclaimer

SanAir Technologies Laboratory, Inc. participates in the Environmental Lead Accreditation Program (ELAP) administered by AIHA-LAP, LLC (Lab ID162952). Refer to our accreditation certificate or www.aihaaccreditedlabs.org for an up to date list of the Fields of Testing for which we are accredited. SanAir also participates in the State of New York's DOH-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards. This report does not constitute endorsement by AIHA-LAP, LLC and/or any other U.S. governmental agencies; and may not be accredited by every local, state or federal regulatory agency.

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SanAir Technologies Laboratory, Inc.

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www.sanair.com

Metals & Lead Chain of Custody

SanAir ID Number 22004757

Company: Arcadia Environmental Inc.	Project #: AE 21121540	Phone #: 541-808-3880
Address: PO Box 1290	Project Name: reedsport Fire Station #7	Phone #: 541-404-9919
City, St., Zip: Coos Bay OR 97420	Date Collected: 1/31/2022	Fax #: 541-808-3169
Samples Collected By: Ken Newman	P.O. Number:	Email: ken@ arcadiaenv.com

Matrix

☐ Air	☐ Aqueous	☐ Bulk
☐ Paint	☐ Sludge	☐ Soil
☐ Solid	☐ Wipe	☐ Water, DW
☐ Dust	☐ Sludge	☐ Wastewater
☐ Other:		

Metals Analysis Types

☑	Total Concentration of Lead	☐	Other:
☐	TCLP Lead		
☐	GFAA		
☐	TCLP / RCRA Metals		
☐	TCLP/ Full (w/ organics)		

*Turn Around Times				
	☐ Same Day	☐ 1 Day	☐ 2 days	☐ 3 Days
	Standard (5 day) ☑	Full TCLP (10d) ☐	Weekend ☐	

*Courier charge for same day and 1 day TAT.

Sample #	Sample Identification/Location	Sample Type	Volume or Area
OPT 51	outside Trim paint		
RIP 52	red interior trim/door paint		
GDEP 53	Garage door exterior paint		

Special Instructions

Relinquished by	Date	Time	Received by	Date	Time
[signature]	01/31/2022	1300	[signature]	2/1/22	1:00

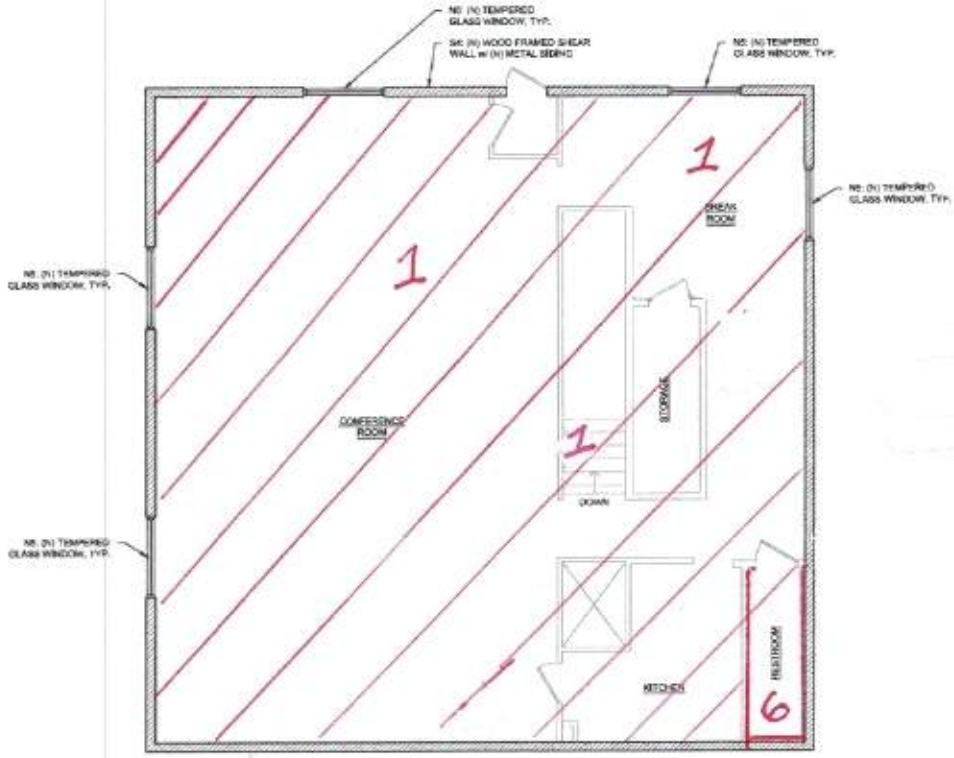
Unless scheduled, the turn around time for all samples received after 5 pm Friday will begin at 8 am Monday morning.
Weekend or Holiday work must be scheduled ahead of time and is charged for rush turn around time.
Work with standard turn around time sent Priority Overnight and Billed To Recipient will be charged a shipping fee.

1 A1.1 **FIRST FLOOR PLAN**

1 = Floor tile

7 = Floor Sheeting

9 = Floor Sheeting under carpet



1 A2.1 **SECOND FLOOR PLAN** 3/16" = 1'-0"

1 = Floor Tile

6 = Sheet Rock Texture

APPENDIX D

PERMIT CONDITION APPROVAL LETTER

NORTHWEST CODE
PROFESSIONALS

From: David R Leifheit
Subject: **Condition Approval**

March 11, 2023

PROJECT: Seismic Retrofit of Police/Fire Station .
Address: 124 N 4th Street, Reedsport
Permit No: 23-C-013
Occupancy: A-3, B, I-3, S-1
Construction Type: V-B

The plans for the above project have been reviewed for compliance to the code references below:
2019 Oregon Structural Specialty Code (OSSC)
2019 Oregon Mechanical Specialty Code (OMSC)
2019 edition of ASHRAE 90.1
2021 Oregon Plumbing Specialty Code (OPSC)
2021 Oregon Electrical Specialty Code (OESC)
2009 Accessible and Usable Buildings and Facilities ICCA117.1

This **condition of approval** letter becomes part of the approved plans and should remain with the approved plans on site all times during construction. The permit applications for the project have been reviewed for compliance with the 2021/2019 Oregon Specialty Codes & ICC A117.1-2009 Accessibility Code as adopted statewide under ORS 455:

Conditions Approval:

1. Deferred Items:
    a. Grouted Micropiles and Attachments

2. Panic and Fire Hardware required for doors providing exiting the A-3 Conference room with an occupant load of 97. OSSC 1010.1.10

3. Exit signs include tactile exit signs. Raised letter and Braille. OSSC 1013.4, A117.1 703.3.10, 703.4.5

4. Special Inspections required.

5. RFIs need to be submitted and approved prior to changes being made. Failure to do so could cause unnecessary delays.

6. The issuance or granting of a permit should not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or of any other laws or ordinances of the jurisdiction. Permits presuming to give authority to violate or cancel

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O: 541-484-9043 OR 800-358-8034 | F: 541-484-6859

the provisions of this code or other laws or ordinances of the jurisdiction shall not be valid.

7. The issuance of this permit is based on construction documents and other data and will not prevent the building official from requiring the correction of any errors in the construction documents and other data.

8. Approved plans are to be on site at the time of inspection.

If there is any disagreement with the code interpretation provided by plans examiner, an appeal can be made to the building official. Appeals of the building official's decisions may be made pursuant to ORS 455.475

David R Leifheit

David R Leifheit / Senior Plan Reviewer & Inspector / DavidL@NWCodePros.com

APPENDIX E

SPECIAL INSPECTIONS FORM

Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

PART 1 – STATEMENT OF SPECIAL INSPECTIONS

When special inspection is required to be performed in accordance with Oregon Structural Specialty Code ("OSSC") chapter 17, a building permit cannot be issued until a statement of special inspections has been submitted by the registered design professional in responsible charge and approved by the Building Safety Division. Pursuant to OSSC section 1704, the statement of special inspections shall identify the materials, systems, components and work requiring special inspection or testing; the type and extent of each special inspection; the type and extent of each test; additional requirements for seismic resistance special inspection or testing; and for each type of special inspection identification as to whether it will be continuous special inspection or periodic special inspection.

Check the items listed below for which special inspection is required to be performed as required by code (please refer to OSSC sections indicated in parentheses) and complete and attach the related Schedule as required for each item checked.

- ☑ Shop fabrication of load-bearing members or lateral load-resisting members or assemblies (1704.2.5):
  - ☑ Special inspection is not required where the work is done on the premises of an approved fabricator (1704.2.5.1): *attach approved fabricator's certificate of compliance or registration by a nationally recognized accrediting authority as approved fabricator*
- ☑ Steel construction (1705.2): *attach* ***Schedule A***
- ☑ Concrete construction (1705.3): *attach* ***Schedule B***
- ☐ Masonry construction (1705.4): *attach* ***Schedule C1 or C2 or C3***
- ☐ Wood construction (1705.5): *attach* ***Schedule D***
- ☑ Soils (1705.6): *attach* ***Schedule E1***
- ☐ Driven deep foundations (1705.7): *attach* ***Schedule E2***
- ☐ Cast in place deep foundations (1705.8): *attach* ***Schedule E3***
- ☐ Helical pile foundations (1705.9): *attach* ***Schedule E4***
- ☐ Special inspections for wind resistance (1705.11): *attach* ***Schedule F***
- ☑ Special inspections for seismic resistance (1705.12): *attach* ***Schedule G***
- ☐ Testing and qualification for seismic resistance (1705.13): *attach* ***Schedule H***
- ☐ Sprayed fire-resistant materials (1705.14): *attach* ***Schedule I***
- ☐ Mastic and intumescent fire-resistant coatings (1705.15): *attach* ***Schedule J***
- ☐ Exterior insulation and finish systems (1705.16): *attach* ***Schedule J***
- ☐ Fire-resistant penetrations and joints (1705.17): *attach* ***Schedule J***
- ☐ Testing for smoke control (1705.18): *attach* ***Schedule J***
- ☐ Radon mitigation inspections (1705.19): *attach* ***Schedule J***
- ☑ Special cases (1705.1.1): *attach* ***Schedule J***

- ☑ Contractors statement of responsibility for main wind or seismic resistance (1704.4): *attach* ***Schedule K***
- ☑ Structural observations (1704.6): *attach* ***Schedule L***

MATTHEW R. SMITH	Matthew Smith	1-26-2023
Responsible Design Professional's Name (Please Print)	Responsible Design Professional's Signature	Date

PART 2 – ACKNOWLEDGEMENTS

Owner, or responsible design professional acting as Owner's agent, hereby acknowledges that it shall employ the Testing Agency or Testing Agencies and Structural Observer identified below who shall provide the special inspections, testing or structural observations as specified in the above Statement of Special Inspections during construction. Before a request for a final inspection can be granted or a Certificate of Occupancy issued by the Building Safety Division, each Testing Agency or Structural Observer as identified below shall submit a final report to the Building Safety Division documenting required special inspections and correction of any discrepancies noted in the inspections (1704.2.4).

Owner Name *(Please Print)*	Owner's Signature	Date
General Contractor Name *(Please Print)*	Contractor's Signature	Date
Testing Agency Name *(Please Print)*	Testing Agency's Signature	Date
Matthew R. Smith	Matthew Smith	1-26-2023
Structural Observer's Name *(Please Print)*	Structural Observer's Signature	Date
Building Safety Division *(Please Print)*	Building Safety Division Approval	Date

Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE A – STEEL CONSTRUCTION (SEE OSSC TABLE 1705.2 AND SECTION 1705.2 EXCEPTIONS)

- [X] 1. Periodic material verification of high-strength bolts, nuts and washers:
  - [X] a. Identification markings to conform to ASTM standards specified in the approved construction documents.
  - [X] b. Manufacturer's certificate of compliance required.
- [X] 2. Inspection of high-strength bolting:
  - [X] a. Periodic inspection of snug tight joints.
  - [ ] b. Periodic inspection of pretensioned and slip-critical joints using turn-of-the-nut with match marking, direct-tension indicator or twist-off bolt methods of installation.
  - [ ] c. Continuous inspection of pretensioned and slip-critical joints using calibrated wrench or turn-of nut without match marking methods of installation.
- [X] 3. Periodic material verification of structural steel:
  - [X] a. Identification of markings to conform to AISC 360 specification in the approved construction documents.
  - [X] b. For other steel, identification markings to conform to ASTM standards specified in the approved construction documents.
  - [X] c. Manufacturer's certified test reports.
- [ ] 4. Material verification of cold-formed steel deck:
  - [ ] a. Manufacturer's certified test reports.
- [X] 5. Periodic material verification of weld filler materials:
  - [X] a. Identification of markings to conform to AWS specification in the approved construction documents.
  - [X] b. Manufacturer's certificate of compliance required.
- [X] 6. Inspection of welding:
  - [ ] a. Structural steel and cold-formed steel deck welding:
    - [X] 1. Continuous inspection of complete and partial penetration groove welds.
    - [X] 2. Continuous inspection of multi-pass fillet welds.
    - [ ] 3. Continuous inspection of single-pass fillet welds > 5/16".
    - [ ] 4. Continuous inspection of plug and slot welds.
    - [X] 5. Periodic inspection of single-pass fillet welds ≤ 5/16".
    - [ ] 6. Periodic inspection of floor and deck welds.
    - [X] Periodic inspection of welded studs not installed with an automatically timed stud welding machine per AWS D1.1 Section 7.
    - [X] Periodic inspection of welded studs installed with an automatically timed stud welding machine per AWS D1.1 Sections 7 & 7.8.1.
  - [ ] b. Inspection of reinforcing steel welding:
    - [ ] 1. Periodic verification of weldability of reinforcing steel other than ASTM A 706.
    - [ ] 2. Continuous inspection of reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, boundary elements of special concrete shear walls and shear reinforcement.
    - [ ] 3. Continuous inspection of shear reinforcement.
    - [ ] 4. Periodic inspection of other reinforcing steel.
- [ ] 7. Inspection of steel frame joint details for compliance with approved construction documents:
  - [ ] a. Periodic details such as bracing and stiffening.
  - [ ] b. Periodic member locations.
  - [ ] c. Periodic application of joint details at each connection.
- [ ] 8. Inspection of open-web steel joists and joist girders (Table 1705.2.3):
  - [ ] a. Periodic inspection of end connections, welded or bolted.
  - [ ] b.1. Periodic inspection of standard bridging, horizontal or diagonal.
  - [ ] b.2. Periodic inspection of bridging that differs from the SJI specifications listed in section 2207.1, horizontal or diagonal.
- [ ] 9. Periodic inspection of cold-formed steel trusses spanning 60 feet or greater (1705.2.4).
  Verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with approved truss submittal package.

Notes:

Return to Statement of Special Inspections

Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE B – CONCRETE CONSTRUCTION (SEE OSSC TABLE 1705.3 AND SECTION 1705.3 EXCEPTIONS)

- [X] 1. Periodic inspection of reinforcing steel, including prestressing tendons, and placement.
- [ ] 2. Inspection of reinforcing steel welding in accordance with AWS D1.4:
  - [ ] a. Periodic verification of weldability of reinforcing bars other than ASTM A706.
  - [ ] b. Periodic inspection of single-pass fillet welds, maximum 5/16".
  - [ ] c. Continuous inspection of all other welds.
- [X] 3. Periodic inspection of anchors cast in concrete.
- [X] 4. Inspection of anchors post-installed in hardened concrete members. (See footnote "b" Table 1705.3):
  - [ ] a. Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.
  - [X] b. Periodic inspection of mechanical anchors and adhesive anchors not defined in 4.a.
- [X] 5. Periodic verification of required design mix.
- [X] 6. Continuously, at time concrete is sampled to fabricate specimens for strength test, perform slump and air content tests, and determine the temperature of the concrete.
- [ ] 7. Continuous inspection of concrete and shotcrete for proper application techniques.
- [ ] 8. Periodic inspection for maintenance of specified curing temperature and techniques.
- [ ] 9. Inspection of prestressed concrete:
  - [ ] a. Continuous inspection of application of prestressing forces.
  - [ ] b. Continuous inspection of grouting of bonded prestressing tendons.
- [ ] 10. Periodic inspection of erection of precast concrete members.
- [ ] 11. Periodic verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.
- [ ] 12. Periodic inspection of formwork for shape, location and dimensions of the concrete member being formed.

Notes:

Return to Statement of Special Inspections

Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE C1 – MASONRY CONSTRUCTION, LEVEL 1 (SEE TMS 402/TABLE 3.1, TMS 602/ TABLE 3 AND 4 OSSC 1705.4 AND 1705.4 EXCEPTIONS) *Required for all masonry, except where specifically exempted by Code.*

- ☐ 1. Periodically verify compliance with the approved submittals per 1.5, TMS 602.

SCHEDULE C2 – MASONRY CONSTRUCTION, LEVEL 2 (SEE TMS 402/TABLE 3.1, TMS 602/TABLE 3 AND 4, OSSC 1705.4 AND 1705.4 EXCEPTIONS) ***Required for engineered masonry in Risk Categories I, II or III or empirically designed masonry, glass unit masonry or masonry veneer in Occupancy Category IV.***
Minimum tests required: *1.) Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Specification Article 1.5 B.1.6.3 for self-consolidating grout. 2.) Verification of f'm and f'aac in accordance with Specification Article 1.4 B prior to construction, except where specifically exempted by this Code.*

- ☐ 1. Periodically verify compliance with the approved submittals per 1.5, TMS 602.
- ☐ 2. Verification as masonry construction begins:
  - ☐ a. Periodic verification of proportions of site-prepared mortar.
  - ☐ b. Periodic verification of grade and size of prestressing tendons and anchorages.
  - ☐ c. Periodic inspection of placement of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages.
  - ☐ d. Periodic inspection of prestressing technique.
  - ☐ e. Continuous verification of thin-bed mortar for AAC masonry for the first 5000 square feet of AAC masonry and periodic after the first 5000 square feet of AAC masonry.
  - ☐ f. Periodic verification of sample panel construction.
- ☐ 3. Verification prior to grouting:
  - ☐ a. Periodic inspection of grout space.
  - ☐ b. Periodic verification of placement of prestressing tendons and anchorages.
  - ☐ c. Periodic verification of placement of reinforcement, connectors, and anchor bolts.
  - ☐ d. Periodic verification of proportions of site-prepared grout and prestressing grout for bonded tendons.
- ☐ 4. Inspections during masonry construction:
  - ☐ a. Periodic verification of materials and procedures with the approved submittals.
  - ☐ b. Periodic inspection of placement of masonry units and mortar joints constriction.
  - ☐ c. Periodic verification of the size and location of structural elements.
  - ☐ d. Periodic verification of the type, size, and location of anchors, including other details of anchorage to masonry to structural members, frames, or other construction.
  - ☐ e. Continuous inspection of welding of reinforcing bars.
  - ☐ f. Periodic verification of preparation, construction, and protection of masonry during cold weather (<40 deg F) or hot weather (>90 deg F).
  - ☐ g. Continuous inspection of the application and measurement of prestressing force.
  - ☐ h. Continuous inspection of the placement of grout and prestressing grout for bonded tendons is in compliance.
  - ☐ i. Continuous inspection for the placement of the AAC masonry units and construction of thin-bed mortar joints for the first 5000 square feet of AAC masonry and periodic for after the first 5000 square feet.
- ☐ 5. Periodic observation of preparation of grout specimens, mortar specimens and/or prisms.

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Return to Statement of Special Inspections

Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE C3 – MASONRY CONSTRUCTION, LEVEL 3 (SEE TMS 402/TABLE 3.1, TMS 602/TABLE 3 AND 4, OSSC 1705.4 AND 1705.4 EXCEPTIONS) ***Required for engineered masonry in Risk Category IV Minimum tests required:*** *1.) Verification of f'm and f'aac in accordance with Article 1.4 B prior to construction and for every 5000 sq. ft. during construction. 2.) Verification of proportions of materials in premixed or preblended mortar, prestressing rout, and grout other than self-consolidating grout, as delivered to the project site. 3.) Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Specification Article 1.5 B.1.6.3 for self-consolidating grout.*

- ☐ 1. Periodic verification of compliance with the approved submittals per 1.5, TMS 602.
- ☐ 2. Verification as masonry construction begins:
  - ☐ a. Periodic verification of proportions of site-prepared mortar.
  - ☐ b. Periodic verification of grade and size of prestressing tendons and anchorages.
  - ☐ c. Periodic inspection of placement of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages.
  - ☐ d. Periodic inspection of prestressing technique.
  - ☐ e. Continuous verification of thin-bed mortar for AAC masonry for the first 5000 square feet of AAC masonry and periodic after the first 5000 square feet of AAC masonry.
  - ☐ f. Continuous verification of sample panel construction.
- ☐ 3. Verification prior to grouting:
  - ☐ a. Continuous inspection of grout space.
  - ☐ b. Periodic verification of placement of prestressing tendons and anchorages.
  - ☐ c. Continuous verification of placement of reinforcement, connectors, and anchor bolts.
  - ☐ d. Periodic verification of proportions of site-prepared grout and prestressing grout for bonded tendons.
- ☐ 4. Inspections during masonry construction:
  - ☐ a. Periodic verification of materials and procedures with the approved submittals.
  - ☐ b. Periodic inspection of placement of masonry units and mortar joints constriction.
  - ☐ c. Periodic verification of the size and location of structural elements.
  - ☐ d. Continuous verification of the type, size, and location of anchors, including other details of anchorage to masonry to structural members, frames, or other construction.
  - ☐ e. Continuous inspection of welding of reinforcing bars.
  - ☐ f. Periodic verification of preparation, construction, and protection of masonry during cold weather (<40 deg F) or hot weather (>90 deg F).
  - ☐ g. Continuous inspection of the application and measurement of prestressing force.
  - ☐ h. Continuous inspection of the placement of grout and prestressing grout for bonded tendons is in compliance.
  - ☐ i. Continuous inspection for the placement of the AAC masonry units and construction of thin-bed mortar joints for the first 5000 square feet of AAC masonry and periodic for after the first 5000 square feet.
- ☐ 5. Continuous observation of preparation of grout specimens, mortar specimens and/or prisms.

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE D – WOOD CONSTRUCTION (SEE OSSC 1705.5) *Shop fabrication of pre-fabricated wood structural elements and assemblies shall be in accordance with OSSC 1704.2.5.*

- ☐ Periodic inspection of site-built assemblies or shops not approved as an approved fabricator per OSSC 1704.2.5 and 1704.2.5.2:
  - ☐ For high-load diaphragms designed in accordance with OSSC 2306.2, periodic verification of sheathing panel grade and thickness, nominal size of framing members at adjoining panel edges, fastener diameter and length, the number of fastener lines and spacing between fasteners and at edge margins with approved building plans, (1705.5.1).
  - ☐ Metal-plate-connected wood trusses spanning 60 feet or greater shall provide verification that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with approved truss submittal package, (1705.5.2)

Notes:

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Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE E1 – SOILS (SEE OSSC TABLE 1705.6 AND EXCEPTIONS)

- [x] 1. Periodic verification that materials below shallow foundations are adequate to achieve the design bearing capacity.
- [x] 2. Periodic verification that excavations have extended to proper depth and have reached proper material.
- [x] 3. Periodic classification and testing of compacted fill materials.
- [ ] 4. Continuous verification of use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.
- [x] 5. Prior to placement of compacted fill, periodically observe subgrade and verify that the site has been properly prepared.

Notes:

SCHEDULE E2 – DRIVEN DEEP FOUNDATIONS (SEE OSSC TABLE 1705.7)

- [ ] 1. Continuous verification that element materials, sizes and lengths comply with the requirements of approved construction documents.
- [ ] 2. Continuous determination of capacities of test elements and conduct additional load tests, as required.
- [ ] 3. Continuous observation of element driving operations and maintain complete and accurate records for each element.
- [ ] 4. Continuous verification of placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.
- [ ] 5. For steel elements, perform additional special inspections in accordance with OSSC 1705.2. *attach* **Schedule A**
- [ ] 6. For concrete elements and concrete-filled elements perform additional special inspections in accordance with OSSC 1705.3. *attach* **Schedule B**
- [ ] 7. For specialty elements, perform additional inspections as determined by the registered designed professional in responsible charge.

Notes:

SCHEDULE E3 – CAST-IN-PLACE DEEP FOUNDATIONS ELEMENTS (SEE OSSC TABLE 1705.8)

- [ ] 1. Continuous observation of drilling operations and maintain complete and accurate records for each element.
- [ ] 2. Continuous verification of placement locations and plumbness; and confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end bearing capacity. Record concrete or grout volumes.
- [ ] 3. For concrete elements perform additional special inspections in accordance with OSSC 1705.3. *attach* **Schedule B**

Notes:

SCHEDULE E4 – HELICAL PILE FOUNDATIONS (SEE OSSC 1705.9)

- [ ] Continuous inspection during the installation of helical piles. Record the installation equipment used, pile dimensions, tip elevations, final depth, final installation torqued and other pertinent installation data as required by the registered design professional in responsible charge. An approved geotechnical report and approved construction documents prepared by a registered design professional shall be used to determine compliance.

Notes:

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE F – SPECIAL INSPECTIONS FOR WIND RESISTANCE (SEE OSSC SECTION 1705.11 AND EXCEPTIONS) *Special inspection for wind resistance required as specified in Sections 1705.11.1 through 1705.11.3 unless exempted by Section 1704.2 for buildings and structures constructed in following areas: 1) In Wind Exposure Category B, where Vasd is 120 miles per hour or greater as determined in accordance with Section 1609.3.1. 2) In wind Exposure Category C or D, where Vasd is 110 miles per hour or greater as determined in accordance with Section 1609.3.1.*

- ☐ Structural wood inspection of the main wind force-resisting system (1705.11.1):
  - ☐ Continuous inspection for structural wood required during field gluing operations of element of the main wind force-resisting systems.
  - ☐ Periodic inspection of structural wood required for nailing, bolting, anchoring and other fastening of components of the main wind force-resisting system with fastener spacing 4 inches on center or less, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs. 1705.11.2
- ☐ Cold-formed steel light-frame construction inspection of the main wind force-resisting system (1705.11.2):
  - ☐ Periodic inspection is required for cold-formed steel light-frame construction during welding operations of elements of the main wind force-resisting system.
  - ☐ Periodic inspection is required for cold-formed steel light-framed construction for screw attachment, bolting, anchoring, and other fastening of components within the main wind force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs. (Only required if sheathing is not gypsum board or fiberboard and is wood or steel sheets with fastener spacing that is less than 4 inches on center.
- ☐ Wind-resisting components periodic special inspection required for fastening of the following systems and components (1705.11.3):
  - ☐ 1. Roof covering, roof deck and roof framing connections.
  - ☐ 2. Exterior wall covering and wall connections to roof and floor diaphragms and framing.

Notes:

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE G – SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE (SEE OSSC SECTION 1705.12 AND EXCEPTIONS)
Unless specifically exempt by the exceptions of 1704.2 and exceptions in section 1705.12.

- ☐ Structural steel inspection in structures assigned to seismic design Categories B, C, D, E, or F, unless exempt by this section (1705.12.1). (see Schedule A)
  - ☐ Inspection of structural steel of seismic force resisting systems in accordance with the quality assurance requirements of AISC 341 Chapter J (1705.12.1.1).
  - ☐ Inspection of structural steel elements other than those other than those covered by 1705.12.1.1, including struts, collectors, chords, and foundation elements. Inspections shall be performed as required by AISC 341, Chapter J.
- ☐ Structural wood inspection for seismic force-resisting systems of structures assigned to Seismic Design Category C, D, E, or F (1705.12.2). (see Schedule D)
  - ☐ Continuous inspection for structural wood required during field gluing operations of element of the seismic force-resisting system.
  - ☐ Periodic inspection of structural wood nailing, bolting, anchoring and other fastening elements of the seismic force-resisting system with fastener spacing 4 inches on center or less, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.
- ☐ Cold-formed steel light-frame construction inspection for the seismic force-resisting systems of structures assigned to Seismic Design Category C, D, E, or F (1705.12.3).
  - ☐ Periodic inspection is required for cold-formed steel light-frame construction during welding operations of elements of the seismic force-resisting system (1705.12.3.1).
  - ☐ Periodic inspection is required for cold-formed steel light-framed construction for screw attachment, bolting, anchoring, and other fastening of components within the seismic for-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs. (Only required if sheathing is not gypsum board or fiberboard and is wood or steel sheets with fastener spacing that is less than 4 inches on center (1705.12.3.2).
- ☐ Designated seismic systems' inspection for structures assigned to Seismic Design Category C, D, E, or F. Construction documents shall specify the requirements for certification by analysis, testing or experience data for nonstructural components and designated seismic systems per ASCE 7 section 13.2.2, verify that labeling, anchorage or mounting systems conform to the certificate of compliance.
- ☑ Architectural components' periodic inspection in structures assigned to Seismic Design Categories D, E or F (1705.12.5):
  - ☑ Periodic inspection erection and fastening of exterior cladding, interior and exterior nonbearing walls, and interior and exterior veneer more than 30 feet in height above grade or walking surface.
  - ☑ Periodic inspection during erection and fastening of exterior cladding, interior and exterior nonbearing walls and veneer weighing more than 15 psf.
  - ☑ Periodic inspection during the anchorage of access floors.
- ☑ Mechanical and electrical components' inspection in structures assigned to Seismic Design Categories C, D, E or F (1705.12.6):
  - ☑ Periodic inspection during anchorage of electrical equipment for emergency or standby power systems.
  - ☑ Periodic inspection is required during the anchorage of other electrical equipment in structures assigned to Seismic Design Category E or F.
  - ☑ Periodic inspection during the installation and the anchorage of piping systems carrying hazardous materials and their associated mechanical units.
  - ☑ Periodic inspection during the installation and the anchorage of HVAC ductwork that will contain hazardous materials.
  - ☑ Periodic inspection during the installation and anchorage of vibration isolation systems where the construction documents require a nominal clearance of 0.25" or less between the equipment support frame and restraint.
  - ☑ Periodic inspection of installation of mechanical and electrical equipment, including duct work, piping systems, and their structural supports, where automatic fire sprinkler systems are installed.
    - ☑ Minimum clearances have been provided as required by section 13.2.3 ASCE/SEI 7.
    - ☑ A nominal clearance of not less than 3 inches has been provided between fire protection.
    - ☑ Sprinkler system drops and springs: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping (minimum clearance inspection not required where flexible sprinkler hose fittings are used).
- ☐ Storage racks in structures assigned to Seismic Design Category D, E, or F (1705.12.7):
  - ☐ Periodic inspection for storage rack anchorage 8 ft or greater in height.
- ☐ Periodic inspection of seismic isolation systems in seismically isolated structures assigned to Seismic Design Category B, C, D, E or F during the fabrication and installation of isolator units and energy dissipation devices (1705.12.8).
- ☐ Periodic inspection of cold-formed steel special bolted moment frames during installation in seismic force-resisting systems of structures assigned to Seismic Design Category D, E or F (1705.12.9).

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Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE H –TESTING AND QUALIFICATION FOR SEISMIC RESISTANCE (SEE OSSC SECTION 1705.13 AND EXCEPTIONS)

Testing for seismic resistance as required in sections 1705.13.1 through 1705.13.4 unless exempted by the exceptions of section 1704.2 (1705.13).

- ☐ Structural steel nondestructive testing for seismic resistance in structures assigned to Seismic Design Category B, C, D, E or F performed in accordance with the quality assurance requirements of AISC 341 (1705.13.1).
  - ☐ Nondestructive testing of structural steel in the seismic force-resisting systems. See exceptions in section 1705.13.1.1.
  - ☐ Nondestructive testing of structural steel elements including struts, collectors, chords, and foundation elements. See exceptions in section 1705.13.1.2.
  - ☐ Verification of certified mill test reports for each shipment of reinforcing steel complying with ASTM A 615 used to resist earthquake induced flexural and axial forces in special moment frames, special structural walls and coupling beams connecting special structural walls, in structures assigned to *Seismic Design Category B, C, D, E, or F,* the reinforcement shall comply with ACI 318 section 21.1.5.2.
  - ☐ Chemical tests in accordance with ACI 318 section 3.5.2 to determine weldability of ASTM A 615 reinforcing steel.
  - ☐ Ultrasonic testing for discontinuities behind and adjacent to welds after joint completion where subject to through-thickness weld shrinkage strains in base metal thicker than 1.5". Acceptance criteria for nondestructive testing shall be as required in ASTM A 435 or ASTM A 898 (Level 1 criteria) as specified by the registered design professional on the construction documents.
- ☐ Testing of nonstructural components such as architectural, mechanical and electrical components in structures assigned *Seismic Design Categories B, C, D, E or F and where the requirements of ASCE* 7 section 13.2.1 item 2 are met by submittal of manufacture's certification and comply with OSSC 1705.13.2:
  - ☐ Manufacturer's certification that the component is seismically qualified by one or more of the following and as specified by the registered design professional on the construction documents:
    - ☐ Analysis.
    - ☐ Testing in accordance with the alternative set forth in ASCE 7 section 13.2.5.
    - ☐ Experience data in accordance with the alternative set forth in ASCE 7 section 13.2.6.
- ☐ Testing of designated seismic systems in structures assigned to Seismic Design Category C, D, E, or F that have mechanical, electrical or plumbing components of the designated seismic systems that are subject to the requirements of ASCE 7 section 13.2.1 or 13.2.2 and comply with OSSC 1705.13.3.
  - ☐ Active mechanical and electrical equipment that must remain operable following the design earthquake ground motion shall be certified exclusively on the basis of approved shake table testing in accordance with ASCE 7 section 13.2.5 or data in accordance with ASCE 7 section 13.2.6.
  - ☐ Components with hazardous substances and assigned an importance factor >1.5 in accordance with ASCE 7 section 13.1.3 shall be certified by the manufacturer as maintaining containment following the design earthquake ground motion by analysis, approved shake table testing in accordance with ASCE 7 section 13.2.5, or data in accordance with ASCE 7 section 13.2.6.
- ☐ Testing of seismic isolation system components in seismically isolated structures assigned to Seismic Design Category B, C, D, E or F, tested in accordance with ASCE 7 section 17.8 (1705.13.4).

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE I – SPRAYED FIRE-RESISTANT MATERIALS (SFRM) (SEE OSSC SECTION 1705.14 AND EXCEPTIONS)

- ☐ The prepared surface of structural members to be sprayed shall be inspected before the application of the SFRM.
- ☐ Verification in accordance with the manufacturer's written instructions of ambient temperature before and after application, substrate conditions, and protection provided.
- ☐ Verification that the thickness of SFRM applied to floor, roof, and wall assemblies and structural members is not more than 10 percent less than the thickness required by the approved fire-resistance design. The thickness measured shall be in accordance with ASTM E 605 as required by the approved fire-resistance design and per section 1705.14.4.1.
  - ☐ Floor, roof, and wall assemblies shall have sampling for determining the thickness of SFRM shall be determined in accordance with ASTM E 605 making not less than 4 measurements per 1,000 sq ft of the sprayed area of each floor or part thereof in each story.
  - ☐ Cellular deck shall have sampling of the SFRM thickness in a 12 inch by 12 inch area. A minimum of 4 measurements shall be made, located symmetrically within the square area.
  - ☐ Fluted decks shall have sampling of the SFRM thickness in a selected square area of 12 inches by 12 inches. A minimum of 4 measurements shall be made, located symmetrically within the square are, including one each of the following: valley, crest and sides. The average shall be reported.
  - ☐ Structural members shall have sampling for determining the thickness of SFRM shall be in accordance with ASTM E 605 and not less than 25 percent of the structural members on each floor.
  - ☐ Beam and girder samplings of SFRM thickness shall be made at 9 locations around the beam or girder at each end of a 12 inch length.
  - ☐ Joist and truss sampling shall be made at 7 locations around the joist or truss at each end of a 12 inch length.
  - ☐ Wide-flanged column sampling of SFRM thickness at 12 locations around the column at each end of a 12 inch length.
  - ☐ Hollow structural section and pipe column sampling of SFRM thickness shall be a minimum of 4 locations around the column at each end of a 12 inch length.
- ☐ Verification that the density of the SFRM is not less than the density specified in the approved fire-resistance design.
- ☐ Determination of the density of SFRM in accordance with ASTM E 605.
  - ☐ Floor, roof, and wall assembly density sampling shall be each floor at the rate of not less than one sample for every 2500 square feet or portion thereof of the sprayed area in each story.
  - ☐ Beams, girders, trusses, and columns density sampling shall be at a rate of not less than one sample for each type of structural member for each 2,500 square feet of floor are or portion thereof in each story.
- ☐ Determination of the bond strength in accordance with ASTM E 736 of cured SFRM applied to floor, roof, wall assemblies, and structural members shall not be less than 150 psf.
  - ☐ Bond strength sampling for floor, roof or wall assemblies for SFRM shall be each floor, roof, and wall assembly at a rate of not less than one sample for every 2,500 square feet of sprayed area, or portion thereof, in each story.
  - ☐ Bond strength sampling for SFRM shall be selected from beams, girders, trusses, columns, and other structural framing members at the rate of not less than one sample for type of structural member for each 2,500 square feet of floor area or portion thereof in each story.
  - ☐ Bond tests for primer, paint, and encapsulant bond tests shall be conducted when the SFRM is applied to a primed, painted or encapsulated surface for which acceptable bond-strength performance between these coatings and the SFRM has not been determined.

Notes:

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE J – SPECIAL CASES

Required for construction materials and systems that are alternatives to materials and systems prescribed by OSSC, unusual design applications of materials described in OSSC, or materials and systems required to be installed in accordance with manufacturer's instructions that prescribe requirements not contained in OSSC or referenced standards. For each item checked below, check the required inspection or testing frequency.

☑ Post-installed anchors in concrete or masonry (see schedules B and C): ☐ Continuous ☑ Periodic

Notes: _____

☐ Powder driven shot-in anchors: ☐ Continuous ☐ Periodic

☐ Shoring: ☐ Continuous ☐ Periodic

☐ Underpinning: ☐ Continuous ☐ Periodic

☐ Manufactured concrete block retaining wall systems: ☐ Continuous ☐ Periodic

☐ Insulated concrete form systems: ☐ Continuous ☐ Periodic

☐ Fabricated items: special inspections of fabricated items shall be performed in accordance with section 1704.2.5 (1705.10):
☐ Continuous ☐ Periodic

Notes: _____

☐ Mastic and intumescent fire-resistant coatings (1705.15).

☐ Exterior insulation and finish system (EIFS). Not Required if EIFS is installed over water-resistive barrier with a means of draining moisture to the exterior or EIFS is installed over concrete or masonry walls (1705.16).

☐ Fire-resistant penetrations and joints in High Rise buildings or buildings assigned a Risk Category III or IV (1705.17).

☐ Testing Smoke Control Systems (1705.18).

☐ Radon mitigation inspections (1705.19):

- ☐ Inspection of soil-gas-retarder membrane after the subfloor preparation inspection and prior to the placement of concrete.
- ☐ Inspection of sealing of construction joints, penetrations, cracks, and other connections after the placement of concrete.

☐ Special cases (1705.1.1):

Notes: _____

☐ Other: _____

☐ Other: _____

☐ Other: _____

Notes:

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE K – CONTRACTOR'S STATEMENT OF RESPONSIBILITY FOR SEISMIC RESISTANCE (OSSC 1704.4)

☑ Contractor's statement of responsibility shall containing the following for Contractor and each Subcontractor responsible for the construction of the main wind or seismic-force-resisting system, designated seismic systems or a wind or seismic-resisting component listed in the statement of special inspections. The contractor and subcontractors shall submit a ***written statement of responsibility*** to the Building Official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain acknowledgement of the awareness of the special requirements contained in the statement of special inspection. Including: special inspections, testing or structural observations for seismic resistance are required as specified by the registered design professional on this Statement of Special Inspection:

- ☑ Acknowledgement of awareness of the special inspection requirements contained in the Statement of Special Inspections and the attached Schedules.
- ☑ Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the Building Safety Division.
- ☑ Procedures for exercising control within Contractor's organization, the method and frequency of reporting and the distribution of the reports.
- ☑ Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

Notes:

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Project Address: 2680 Frontage Rd, Reedsport, OR 97467 Permit #: _____

Risk Category (1604.5): IV Seismic Design Category (1613.2.5): D

SCHEDULE L – STRUCTURAL OBSERVATIONS (OSSC 1704.6)

Prior to the commencement of observations, the structural observer shall submit to the Building Official a ***written statement*** identifying the frequency and extent of structural observations. At the conclusion of the work included in the permit, the structural observer shall submit to the Building Official a ***written statement*** that the site visits have been made and identify any reported deficiencies which, to the best of the structural observer's knowledge, have not been resolved.

- [X] Structural observations for structures where one or more of the following conditions exist (1704.6.1).
  - [ ] Structural observations for structures classified as Risk Category IV.
  - [ ] Structural observations for high-rise building, height greater than 75 ft above the base.
  - [X] Structural observations for structures when so designated by the registered design professional in responsible charge of the design.
  - [X] Structural observations for structures when specifically required by the Building Official.
- [X] Structural observations for seismic resistance for structures assigned to Seismic Design Category D, E, or F where one or more of the following conditions exist (1704.6.2).
  - [X] Structural observations for structures classified as Risk Categories III or IV.
  - [ ] Structural observations for structures assigned to Seismic Design Category E, classified as Risk Category I or II and is greater than 2 stories above grade plane.
- [ ] Structural observations for Wind resistance: for structures sited where V is 130 mph or greater and the structure is classified as Risk Category III or IV (1704.6.3).

Notes:

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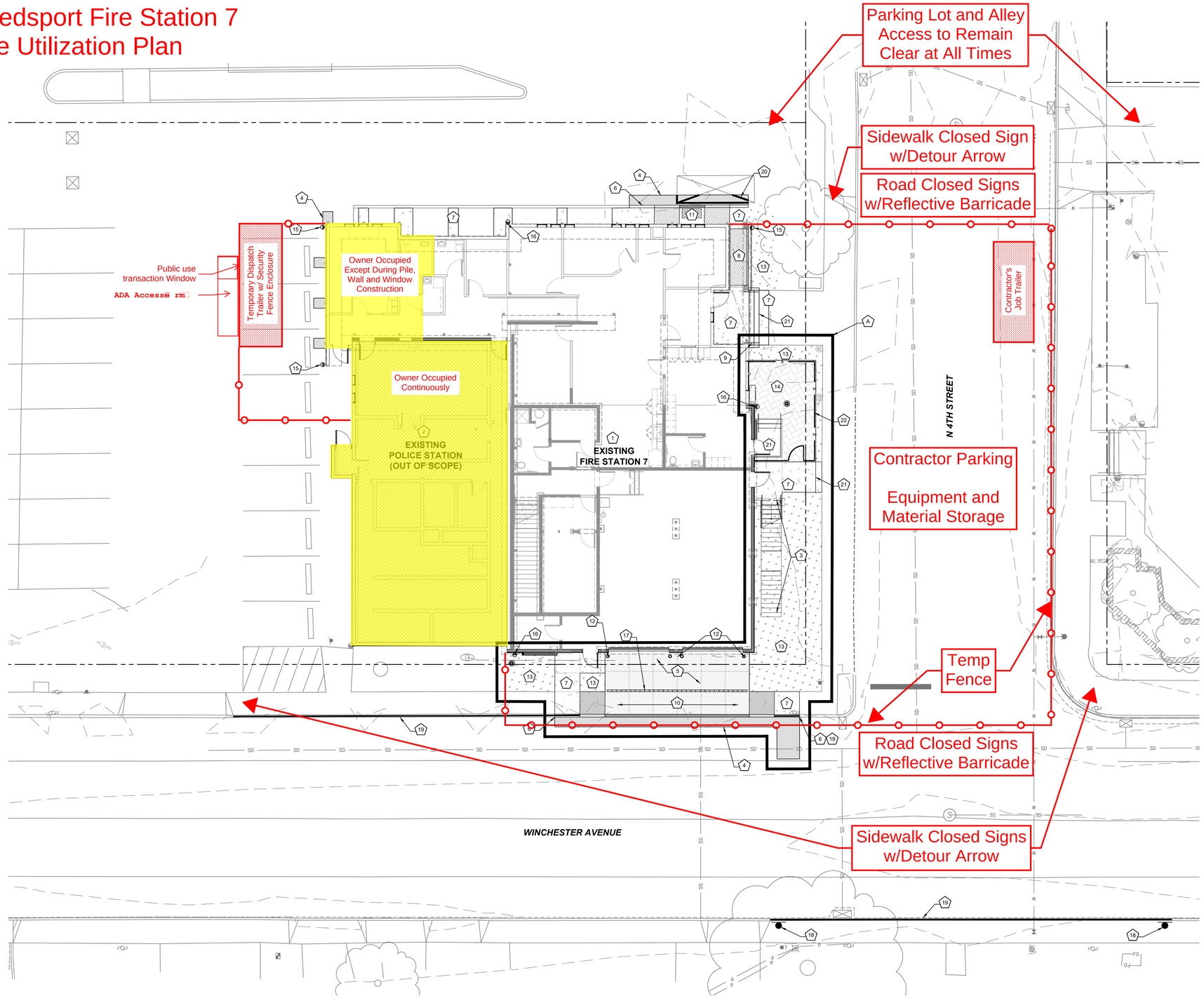
APPENDIX F

SITE UTILIZATION PLAN

Reedsport Fire Station 7
Site Utilization Plan



1 C2.00 **CIVIL SITE PLAN**

1"=10'

ONE INCH EQUALS FULL SCALE

CONSTRUCTION NOTES:

GENERAL CONSTRUCTION NOTES:

***** ALL CONCRETE/ASPHALT/GRAVEL PAVEMENT SECTIONS SHALL BE CONSTRUCTED OVER 'Propex' 'Geotex 200 ST' WOVEN PERMEABLE GEOTEXTILE SUPPORT FABRIC OVER HARD AND UNYIELDING SUBGRADE. REFER TO PROJECT GEOTECHNICAL REPORT AND SITE PREPARATION NOTES FOR ADDITIONAL INFORMATION REGARDING PAVEMENT AND SUBGRADE PREPARATION.**

***** TRANSITION BETWEEN NEW AND EXISTING ASPHALT/CONCRETE/CURB SHALL BE FLUSH AND FREE FROM ABRUPT CHANGES IN HEIGHT.**

***** CONSTRUCT PAVING, STRUCTURES, AND PIPING TO GRADES, ELEVATIONS, AND ALIGNMENTS SHOWN ON PLAN.**

***** PROVIDE SUBMITTALS TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING MATERIALS.**

SITE CONSTRUCTION NOTES:

KEYNOTE (A) INDICATES ITEM NOT INCLUDED IN SCOPE OF SEISMIC RETROFIT WORK.

1. VERIFY LIMITS OF BUILDING FOOTPRINT WITH ARCHITECTURAL AND STRUCTURAL PLANS PRIOR TO CONSTRUCTION. NOTIFY ENGINEER IN THE EVENT OF DISCREPANCIES.
2. POLICE STATION. HATCHED AREA OUT OF SCOPE.
3. NEW EXTERIOR STAIR CONFIGURATION. REFER TO ARCHITECTURAL AND STRUCTURAL PLANS PRIOR TO CONSTRUCTION. NOTIFY ENGINEER IN THE EVENT OF DISCREPANCIES.
4. NEW HEAVY DUTY ASPHALT PAVEMENT, TYPICAL. REFER TO SHEET C3.00 FOR MORE INFORMATION.
5. NEW REINFORCED CONCRETE PAVEMENT. REFER TO SHEET C3.00 FOR MORE INFORMATION.
6. NEW STANDARD CONCRETE CURB. REFER TO SHEET C3.00 FOR MORE INFORMATION
7. NEW CONCRETE SIDEWALK, TYPICAL. REFER TO SHEET C3.00 FOR MORE INFORMATION.
8. NEW ACCESSIBLE RAMP WITH HANDRAIL AND CHEEK WALL. REFER TO SHEET C3.00 FOR MORE INFORMATION.
9. NEW HANDRAIL. REFER TO SHEET C3.00 FOR MORE INFORMATION.
10. NEW FULLY LOWERED REINFORCED CONCRETE DRIVEWAY APRON. REFER TO SHEET C3.00 FOR MORE INFORMATION.
11. NEW PARALLEL CURB RAMP. REFER TO SHEET C3.00 FOR MORE INFORMATION.
12. NEW CONCRETE BOLLARD. REFER TO DETAIL 1 ON SHEET C4.00 FOR MORE INFORMATION.
13. NEW LANDSCAPE PLANTER. REFER TO LANDSCAPE NOTES ON SHEET C0.02 FOR MORE INFORMATION AND COORDINATE WITH OWNER BEFORE PLANTING, TYPICAL.
14. NEW CONCRETE PAVERS. REFER TO SHEET C3.00 FOR MORE INFORMATION.
15. PROVIDE AND INSTALL CONCRETE SPLASH BLOCK AT DOWNSPOUT LOCATIONS APPROXIMATELY AS SHOWN (±3 TOTAL).
16. APPROXIMATE LOCATION OF NEW DOWNSPOUT CONNECTION. REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATIONS. FURNISH AND INSTALL NEW DOWNSPOUT BOOT AND CLEANOUT SIMILAR TO DETAIL 5 ON SHEET C4.00.
17. NEW 'NDS' 'DURASLOPE' CHANNEL DRAIN (OR APPROVED EQUAL). REFER TO SHEET C3.00 FOR MORE INFORMATION.
18. FURNISH AND INSTALL 'NO PARKING' SIGN (MUTCD R7-1) AT LOCATION SHOWN.
19. PAINT CURB SOLID YELLOW WHERE INDICATED. DETERMINE EXACT LIMITS WITH TRAFFIC REPORT PREPARED BY 'SANDOW ENGINEERING'.
20. PAINT 4" SOLID WHITE STRIPING TO MATCH EXISTING.
21. NEW CONCRETE STAIR. REFER TO SHEET C3.00 FOR MORE INFORMATION.
22. NEW FENCE. REFER TO ARCHITECTURAL PLANS FOR ALL INFORMATION.

ZCS ENGINEERING ARCHITECTURE
127 NW D Street, Grants Pass, Oregon 97526 | 541-479-3865

REEDSPORT FIRE DISTRICT
124 N 4TH ST.
REEDSPORT, OR 97467

REEDSPORT FIRE STATION 7

REVISION ID:	DATE:

PROJECT NO:	G-1468-21
DRAWN:	CMW
CHECKED:	MKW
DATE:	01-24-23

10 0 5 10 20
(FEET)
1 INCH = 10 FT

CIVIL SITE PLAN

C2.00

FOR INFORMATION ONLY